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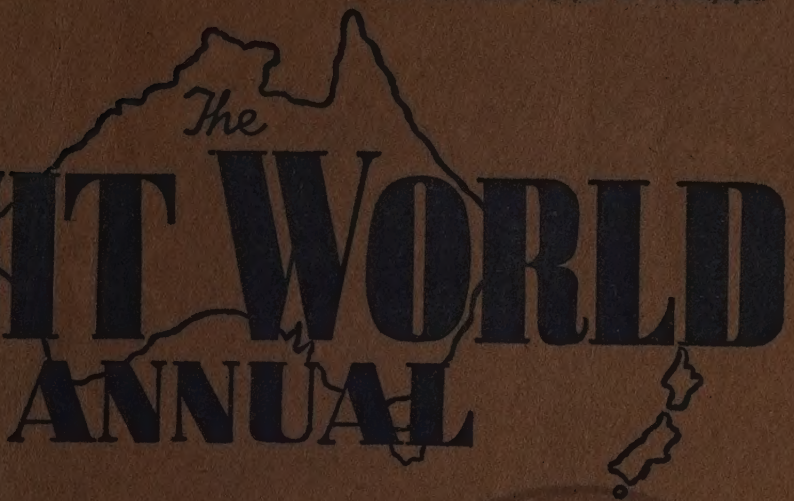
The FRUIT WORLD ANNUAL



A Book of Daily Reference for Growers of Apples, Pears, Vine, Citrus & Stone Fruits, Exporters Marketgrowers Etc.

PUBLISHED BY THE FRUIT WORLD PTY. LTD.

Established 47 Years.

8-12 ORR STREET (off 78 Victoria Street), MELBOURNE.

Postal Address: Box 1944, G.P.O., Melbourne. (Tel., F 2656, two lines.)

And at 439 Kent Street, Sydney. (Tel., M 6751, three lines.)

A Comprehensive Publication Embracing all Cultural Aspects of the Fruitgrowing Industry and a Book of Daily Reference for all Sections of the Industry.

The FRUIT WORLD ANNUAL

An Accurate Statistical Review and Reliable Guide for the Orchardist, Packer, Canner and Fruit Trader, etc.

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Spraying and Dusting for the Control of Insect Pests and Fungous Diseases

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In Orchards — Vineyards — Citrus Groves and Vegetable Gardens

MANY factors such as soil, aspect, correct varieties, interpollination, drainage, manuring, cultivation, pest control, etc., are essential for success in fruit-growing.

Other aspects also come under consideration, such as correct stage of picking, cool storage, as well as the all important subject of marketing.

Various phases of the Australian fruit industry are dealt with in this Annual.

However, in this section, the very important matter of pest and disease control is set forth. The major pests of fruit trees, vines, and vegetable gardens are described and illustrated, together with the latest known methods of control.

For leaf and fruit eating pests, arsenate of lead is the standard remedy. In orchards and vineyards, spraying is the chief method of application. At certain stages oil sprays are given for codling moth control. The oil acts as an ovicide for the eggs. In vegetable gardens, arsenate of lead is frequently used in dust form, and is applied by means of blowers.

With regard to the method of application, thoroughness is essential. For codling moth control, in order to have spray applications properly timed, lure pots should be placed in trees in order to ascertain the peak flight of moths. Lures consist of wine, Apple juice or cider; golden syrup and molasses are useful but less reliable than wine and more prone to trap extraneous insects.

For aphis and sucking insects, nicotine extract is used, also oils and standard proprietary sprays.

Scale insects are controlled by fumigation and spraying.

For fungus diseases the standard remedies are Bordeaux and Burgundy mixture, and lime sulphur. The time of application is most important.

The following are the broad lines of control.

Hints are now given regarding the various seasonal operations, as follow:—

In Summer: Spray citrus trees with white oils or fumigate with hydrocyanic acid gas to kill scales. Continue with arsenate of lead on deciduous trees; white Summer spraying oils will kill the codling moth eggs, and generally control aphis, red spider and other orchard pests. Continue with nicotine for aphides and scales. Dust with nicotine or pyrethrum insecticides.

In Autumn: Spray deciduous trees with arsenate of lead for leaf and fruit-eating pests. Spray Apricot trees in May with Bordeaux 6-4-40 plus 1 lb. lime casein spreader to 100 gallons of spray, this being one of the necessary sprays to control scab or shot hole.

In Winter: Spray deciduous trees with red oil, or lime-sulphur, to check San Jose, mussel and olive scale, red spider, bryobia mite, Pear phytoptus.

For several fruit rots, spray in mid-Winter, after pruning, with Bordeaux, 6-3-40. Spray vines with red oil, 1-20, to kill vine scale.

Late Winter (and before buds open in the Spring). — Spray with red oil for scales and mites, and with Bordeaux or lime-sulphur for fungous diseases. Lime-sulphur also destroys red spider and woolly aphis. Apply tar distillate, 1 in 35 as an ovicide to Peach and Cherry trees, before bud movement, to control aphis.

In Spring: Spray deciduous trees and vines with Bordeaux or Bungundy mixture against black spot, leaf curl and other fungous diseases.

Spray with arsenate of lead for codling moth and leaf-eating insects. Many growers use for the "calyx" spray on Apples and Pears, a combination of arsenate of lead with a fungicide. As a fungicide some growers use lime-sulphur, others Bordeaux or Burgundy.

In Spring, spray Peach, Nectarine, Plum trees, Roses, shrubs and garden plants with nicotine preparations to kill aphides scales and plant bugs.

Spray Apricot trees with Bordeaux 6-4-40 plus 1 lb. lime casein spreader during pink bud stage.

For vegetable culture the foregoing hints are generally applicable. However, the practice of dusting with insecticides and fungicides is approved practice.

SOME REASONS FOR SPRAYING FAILURES.

1. Failure to spray at the correct time. Fungicides are preventives and should be applied as such. After the disease has developed it may be too late to save the crop.
2. Spraying when the sun is very hot may cause scald to fruit and foliage.
3. Spraying during or just after a shower or heavy dew results in much of the value of the spray being lost. When the leaves are dry, the spray is more effective.
4. The applying of Winter strength spray in Summer may cause severe burning, or the application of Summer strength spray in Winter may be too weak to be effective.
5. Failure to spray every tree.
6. Spraying while trees are in full bloom may injure the blossoms and may also poison bees, which assist in the pollination.
7. Faulty application. If the spray is applied hurriedly, the fruit and foliage may in consequence be not properly protected.

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The foregoing information sets out the general outline for the control of insect pests and fungous diseases.

Detailed information and illustrations of the major pests and diseases are given on the following pages.

CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

Woolly Aphis.—This aphis lives in hollows and crevices, on the roots, trunks, and limbs of the Apple tree, causing very unsightly swellings, made by the pricking of their beak-like rostrums (or sucking tubes), thus absorbing the juices of the tree. They are manifested mainly by a white, downy appearance on the twigs, limbs and branches.

Aphis of Peach (Black and Green).—Black and Green Aphis infest branches and leaves, causing the latter to curl and dry up. They are very troublesome when the young shoots are beginning to grow in spring.
Black aphis infest roots.
Various Aphis also attack Roses, Carnations, Pansies, and garden plants.

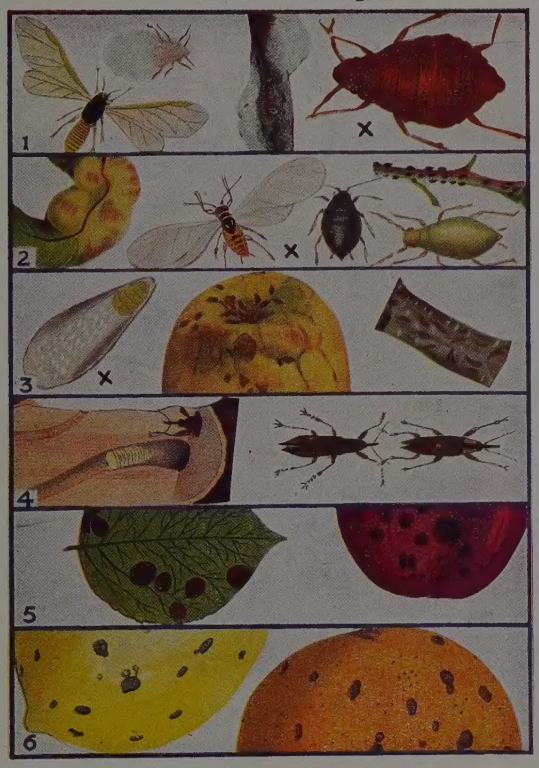
Apple Mussel Scale.—Attacks the fruit and branches of Apples, Pears, Plums, etc., disfigures the fruit; absorbs sap. If unchecked, will encrust the trunk and main arms.

Apricot Beetles.—Small Weevils with a tapering body, most destructive; they do great damage by boring and tunnelling into Apricot trees.

Black Spot of Apple and Pears.—These fungi attack both fruit and leaves. On the fruit they form dark green, often circular, velvety patches, and generally cause the fruit to crack. On the leaves they appear as round or oval spots.

Black Spot of Orange and Lemon.—The round sunken spots are of a dark brown color, and nestling in the centre are the minute, black, punctiform pustules, visible to the naked eye.

Pest or Disease. (X magnified.)



Methods of Control of Insect Pests and Plant Diseases (illustrated above).

(1) **APHIS, WOOLLY (Eriosoma lanigera).**—Attacks Apple and Pear trees. **Introduce Aphelinus parasite into orchards.** Spray forcibly with nicotine solutions, white oils in summer, and Red Oil in winter. A combination winter spray, Nicotine Sulphate, Red Oil and soap has been found effective. Use pyrethrum dusts. Grow trees having blight-proof stocks.

(2) **APHIS OF PEACH.**—There are two aphids commonly attacking the Peach:—

Green Peach Aphis—**Myzus persicae.**

Black Peach Aphis—**Anuraphis persicae-niger.**

For Green Peach Aphis, use tar distillate 1 in 35 before mid-July; lime sulphur during winter; and white oil and nicotine sprays in the summer. It may be necessary to spray the trees several times in the summer. Keep ground near trees free from weeds.

For Black Peach Aphis, use nicotine sulphate or tobacco sprays in the summer. It may be necessary to spray the trees several times in the summer. Keep ground near trees free from weeds.

For the various aphids attacking Roses, Carnations, garden plants and vegetables, use tobacco sprays or dusts.

(3) **APPLE MUSSEL SCALE (Lepidosaphes ulmi).**—Spray in winter with Miscible Red Oils, 1 in 25, or Lime Sulphur, 1 in 15. Spray in summer with White Oils or nicotine solutions.

(4) **APRICOT BEETLES (Belus sp.).**—Spray with Arsenate of Lead. Inject Bisulphide of Carbon into tunnels made by beetles.

(5) **BLACK SPOT OF APPLE (Venturia inaequalis).**—Spray with Bordeaux Mixture 6-4-40 at the green tip stage, followed by Lime Sulphur 2-80 at petal fall stage, followed by Lime Sulphur 1 in 80 two weeks later.

For Pear Spot (Venturia pirina), spray with Bordeaux Mixture, 6-4-40, when the young folded leaves are just protruding from the bud, and again at a slightly later stage, when the young folded leaves and the blossom bud have separated. The blossom buds would still be green.

Some growers follow up with 4-5 ozs. of bluestone with every 80 gallon vat of lead spray, using also 1 lb. lime casein spreader, or Bordeaux mixture 3-3-50 three weeks after the fruit has formed. The above schedule should not be used for Josephine Pears.

(6) **BLACK SPOT OF ORANGE and LEMON (Phoma citricarpa).**—Spray with neutral Bordeaux, 3-3-50, at the first appearance of blossom. If this stage is missed, spray 6-4-100 when fruit is well set. Citrus trees, where the drainage is not efficient, are more prone to this disease than trees on well-drained plantations. Use Sulphate of Iron, ½ lb. to each tree.

CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

Black Spot of Vine. — The spores are ever-present. Under genial conditions for incubation and growth, the disease spreads rapidly, causing much loss. The disease seldom appears in dry seasons.

Brown Rot.—One of the most serious fungus diseases, the twigs, blossoms and fruit are attacked. (1) Blossom attack looks like frost injury. (2) The infected area on fruit spreads in concentric rings, which consist of millions of summer spores.

Cherry Borer.—The grub of the moth destroys Cherry, Apricot, Peach, Pear and Plum trees by boring into the branches, leaving a sawdust-like appearance on the outside of the hole.

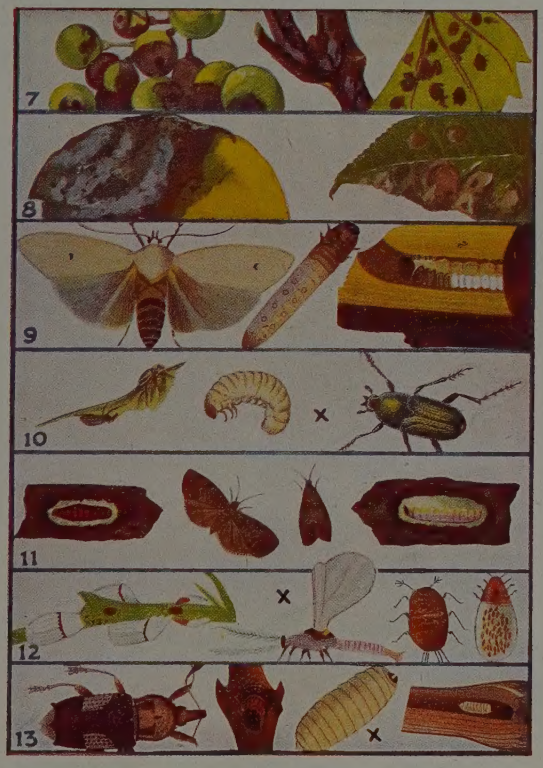
Cherry Green Beetle.—Attacks the leaves of Cherry, Peach, Plum and Apple trees, Roses, and garden plants, etc., and, being in large swarms, will strip a tree in a very short time.

Codling Moth.—The grubs, which hatch in eight or nine days from eggs laid at calyx of young fruit and on leaves, eat into the core; then they eat a tunnel to the outside of the fruit and lower themselves to the ground, and recommence the life-cycle. Several broods appear each season.

Cottony Cushion Scale.—A cushion-shaped scale insect, with a whitish-yellow, cottony down; attacks the leaves and stems.

Curculio of Vine. — A small boring weevil, reddish-brown, with light markings; very destructive. Will remain for twelve months or more in the wood.

Pest or Disease. (X magnified.)



Methods of Control of Insect Pests and Plant Diseases (illustrated above).

(7) **BLACK SPOT OF THE VINE [Anthracnose] (Manginia ampelina).**—Swab with Acid Iron Solution in early spring before vines show movement. Spray with Bordeaux or Burgundy Mixture (alkaline) when buds are bursting. Follow with Bordeaux or Burgundy neutral, giving applications according to weather conditions.

(8) **BROWN ROT (Sclerotinia fructicola).**—Attacks Peach, Plum, and other stone fruit. Destroy mummified fruit. Spray Peaches, Plums, with Bordeaux 6-4-40 at bud movement; follow with Dry Mix Lime Sulphur, 25 lbs. to 100 gallons, at petal fall, when the fruit is half grown and five weeks before picking; Apricots, Bordeaux, 6-4-40 early pink bud and late pink bud.

(9) **CHERRY BORER (Maroga unipunctata).**—Clear away the sawdust-like matter, inject Bisulphide of Carbon into tunnel; when using carbon, close mouth of tunnel immediately to keep fumes from escaping. Caterpillars can be destroyed by probing the tunnel.

(10) **CHERRY GREEN BEETLE (Diphucephala colaspidoides).**—If no fruit on the tree, spray well with Arsenate of Lead when beetle appears. When fruit is ripening, spray with Hellebore powder, 1 oz. in 2 gallons of warm water. This should be used perfectly fresh, as it is liable to deteriorate with age or exposure.

(11) **CODLING MOTH (Cydia pomonella).**—Attacks Apple, Pear, Apricot, Quince, Loquat, Walnut, etc. Spray with Arsenate of Lead, first after petals fall and before calyx cup closes, and at intervals of 21-30 days until within three weeks of gathering fruit. Fungicides may be used with calyx spray. Excellent results have been secured by spraying with White Oils after first Arsenate of Lead spray. Destroy fallen infected fruit. If bandaging trees, examine and destroy larvae, at least every 10 days. Use chemical bandages.

(12 **COTTONY-CUSHION SCALE (Icerya purchasi).**—Attacks Orange, Lemon and other citrus trees, shrubs, hedge plants, etc., very severe on Pittosporum hedges. Spray with White Oil when the trees are making a decided growth about November. This is the time of the release of the young scale in most districts.

(13) **CURCULIO OF VINE (Orthorrhinus Kluggii).**—Inject Bisulphide of Carbon into tunnel and close mouth. Probe with wire. Deterrent.—Spray with Lime-Sulphur in winter.

CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

Downy Mildew of Vine.—This serious disease over-winters in the dead leaves infected during the preceding summer. Infection in the spring takes place through spores being splashed up by falling rain. These over-wintering spores (or oospores) retain vitality for over 12 months.

Elephant Beetle of Orange and Lemon.—A large brownish weevil with a long snout. This has become a serious pest to citrus trees. It bores into the trunks of the trees, causing them to die. It is also a pest of Elm and other street trees.

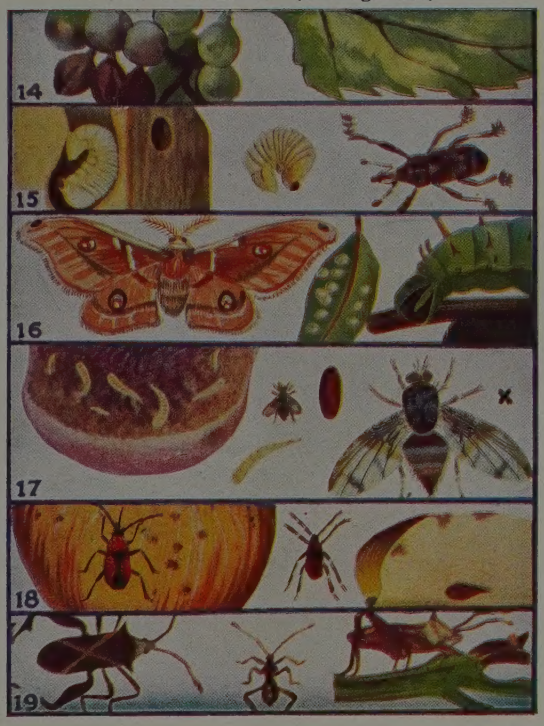
Emperor Gum Moth.—One of the largest Victorian moths. Grey in color with an eye-like spot on each wing, the larvae feed on Apple and Pear trees, also Eucalyptus and Pepper trees. Very destructive to Roses.

Fruit Fly.—The female punctures the fruit with its ovipositor, and deposits the eggs. Fruit is punctured in all stages, from green to ripe. The eggs hatch in two to five days in summer, and 10 to 15 in winter. In walking the wings are drooped. In summer the fly may complete its cycle from eggs to fly in 20 days.

Harlequin Fruit Bug.—These bugs, by making holes in the rind of the Apple with their rostrums (or sucking tubes), draw out the juice, causing the fruit to spot. They are also very destructive to garden plants, especially Dahlias, Tomatoes, etc.

Holy or Cross Bug.—This plant bug is a native insect and is very destructive to all kinds of Wattles (Acacias) and citrus trees. Like all plant bugs, this species sucks the sap with its rostrum or beak, causing the trees (twigs) to turn black and die down.

Pest or Disease. (X magnified.)



Methods of Control of Insect Pests and Plant Diseases (illustrated above).

(14) DOWNY MILDEW OF THE VINE (Plasmopara viticola).—Spray with alkaline Copper Soda when vine shoots have grown 8 to 10 leaves. Subsequent sprayings about every seven days if weather conducive to fungus development. The summer treatment for Black Spot and Downy Mildew is identical.

(15) ELEPHANT BEETLE OF THE ORANGE AND LEMON (Orthorrhinus cylindrostris).—No satisfactory method is known for the control of this pest.

(16) EMPEROR GUM MOTH (Antherea eucalypti).—Spray when observed with Arsenate of Lead.

(17) FRUIT FLY [Mediterranean] **(Ceratitis capitata).** — Attacks Peach, Orange, Banana, Quince, Apple, Tomato, Grape, etc. Kerosene in shallow vessels attracts the fly.

Destroy all infected fruit. Destroy weeds, work ground well under trees; poultry and insectivorous birds destroy chrysalids. Use a spraying solution—1 gallon of fruit juice (boil refuse fruit for about one hour), 1 lb. Arsenate of Lead, 25 gallons of water. Spray on windward side of tree.

A Good Lure.—One tablespoonful Scrubbs' ammonia, one teaspoonful essence of vanilla, 1½ pints water. A dessertspoonful of black treacle may be added, but is not essential. "Clensel" and other lures have been used with good results.

(18) HARLEQUIN FRUIT BUG (Dindymus versicolor).—Spray with Nicotine Solutions, Benzole Emulsion, White Oil or Clensel (1 in 25), whenever observed. Keep orchards free of marsh mallows.

(19) HOLY OR CROSS BUG (Mictis profana).—When observed, spray with Benzole Emulsion, Nicotine Extracts, or Pine Spray. Shake trees over piece of blanket, and destroy all bugs that fall. Spray with Benzol Emulsion.

Methods of Control of Insect Pests, as illustrated on opposite page.

(20) **LEAF CURL OF PEACH.**—By spraying in the late dormant period, or when the earliest buds are showing the slightest trace of pink, Leaf Curl can be prevented. Use Bordeaux Mixture (6-4-40). Finish spraying by the "early pink" stage.

(21) **LEMON LEAF AND PEEL SCALE (Mytilapsis citricola).**—Thin out all dead or diseased wood. Spray with White Oil, 1-40, when trees are making decided growth. Make solution soapy by adding 4 ozs. of a good hard soap to each 40 gallons. Fumigate with Hydrocyanic Acid Gas.

(22) **LIGHT BROWN APPLE MOTH (Tortrix postvittana).** — This pest is very common in home gardens, attacking Roses, Dahlias, Tomatoes, etc. The caterpillar is very lively, and quickly escapes if disturbed. Spray with Arsenate of Lead, same as for Codling Moth, No. 11.

(23) **"LOOPERS" OR LOOPER CATERPILLARS (Phrissogonus sp.).**—These attack fruit trees, particularly Apples, Pears and Cherries; and garden plants in the spring. Spray with Arsenate of Lead.

(24) **OIDIUM [Powdery Mildew of the Vine] (Oidium Tuckerii).**—Dust the vines with Flowers of Sulphur; first application when new shoots are six inches long; also dust with Sulphur just before blooming and after the fruit has formed. Keep vineyard clear of weeds.

(25) **OLEANDER OR ROUND WHITE SCALE (Aspidiotus hederae).**—Attack Orange and Lemon trees, also Oleanders and garden shrubs, palms, ferns, etc. Spray well with White Oil or Nicotine solution when young are hatching (in summer). Starch spray is also recommended. On Palms, Dracaenas, Ferns, etc., use the Starch spray.

(26) **OLIVE OR BLACK SCALE (Saissetia oleae).**—Attacks citrus, Apple, Apricot, vine, Olive, Pear, and Plum trees, also garden shrubs. Spray between November and March with White Oils. When young scale are moving is the favored time for their destruction.

(27) **ORANGE BUTTERFLY (Papilio anactus).**—Spray with Arsenate of Lead.

CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

Leaf Curl of Peach.—When affected with Leaf Curl (Exoascus deformans), the first-formed leaves become thickened, puckered and discoloured, and soon fall away. The fungus seems to winter in the buds.

Lemon Leaf and Peel Scale. — A small, dark-colored, mussel-shaped scale; the insect attacks leaves, bark and fruit of Lemon, Orange, Citron, Grapefruit, etc.

Light Brown Apple Moth.—These insects often attack late Apples, such as Yates, as late as March. Very destructive to Roses and garden plants.

Looper Caterpillar.—The caterpillar loops its body up when walking. Some caterpillars resemble dead twigs. They are native insects and are becoming a serious pest in many parts of Victoria.

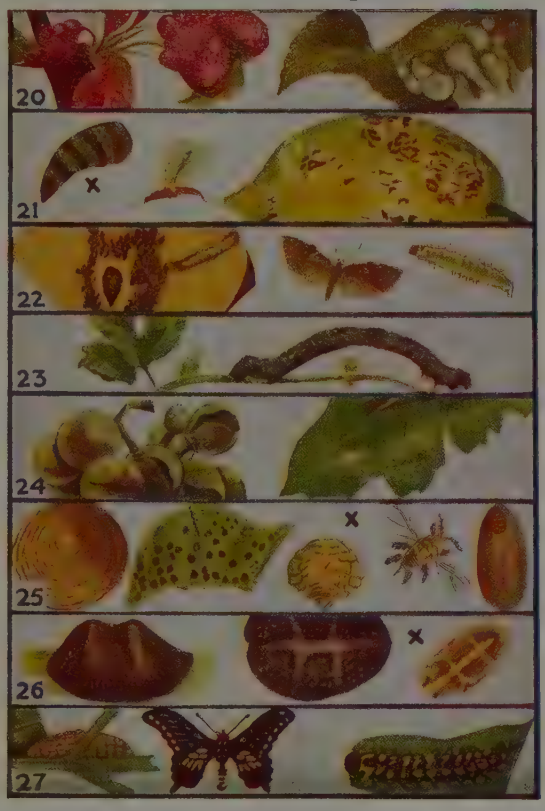
Oidium (Powdery Mildew of Vine).—This fungus appears during the growing season under sultry conditions, such as during a damp spring or after thunderstorms in summer. Dense undergrowth of weeds also tends to create conditions favorable for Oidium development.

Oleander or Round White Scale.—A small, light, greyish-brown, sometimes whitish scale, which attacks the leaves and stem, and is a most difficult insect to destroy when trees are badly infested with it.

Olive or Black Scale.—These destructive scales cause sooty fungus to develop on the leaves, making trees sickly. The scales are light brown when young with an H-like marking on back of scale.

Orange Butterfly.—In the warmer parts of Victoria these insects usually appear early in November. The yellow and black spiny caterpillars will attack Grapefruit if Orange or Lemon trees are not available; they attack the leaves, flowers and fruits of citrus.

Pest or Disease. (X magnified.)



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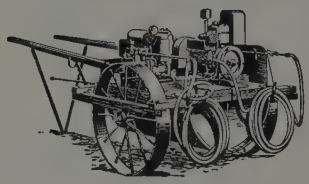

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Toomuc Valley Orchards	6 plants
The Eagle Family, Harcourt	7 plants
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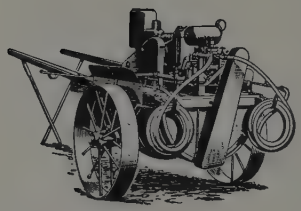

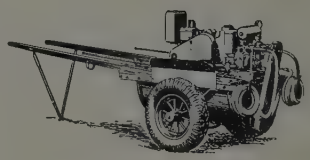

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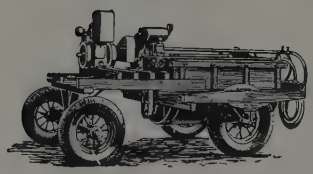

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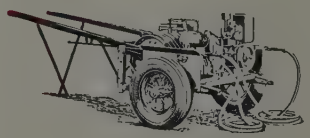

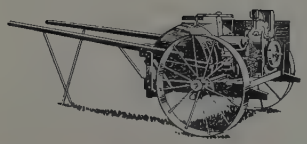

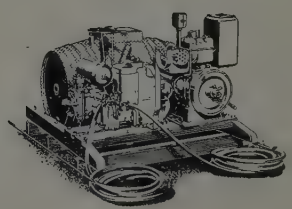

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CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

Orange Moth.—The larvae of this moth feed on the leaves and young shoots, and are very destructive. The caterpillars of this moth destroy young flowers, buds and young shoots or Orange and Lemon, as well as the foliage.

Painted Apple Moth.—The caterpillars are covered with dark grey tufts of hairs on back near tail. They do great damage by eating the epidermis or surface of the leaves, also young shoots. These moths often appear when the flowers of Apples, Pears, Quinces, etc., are commencing to show. It may therefore be necessary to spray early.

Pear Phytoptus or Pear Leaf Blister Mite. — These mites, by sucking away the juice of the leaves, cause them to turn brown and nearly black. Also attacks fruit.

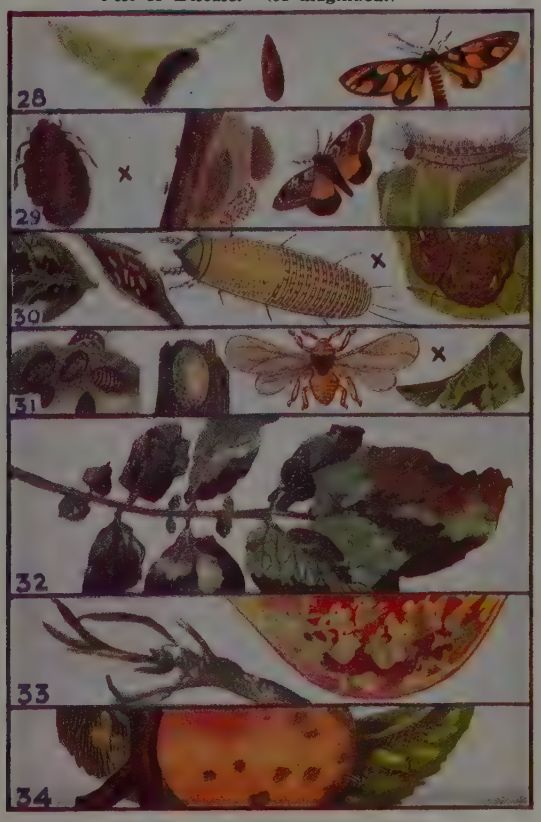
Phylloxera.—Attacks leaves and roots, growth becomes stunted, and leaves turn yellow.

Potato Blight (Irish).—Attacks Potatoes, Tomatoes, etc. The first indication seen on the leaf is a slight reduction in the intensity of the coloring matter, followed by the appearance of the brownish blotches at the edge of the leaf. In humid weather they spread with immense rapidity. The disease travels down the haulms, and the plant may within a few hours become a blackish mass, emitting an evil odor. Wet seasons favor the disease.

Powdery Mildew. — A serious disease, which attacks leaves, shoots, blossom-buds and fruits of Apples and Pears. Leaves and buds become covered with glistening white masses; fruit is disfigured and small.

Prune Rust.—Attacks Plum trees. Golden yellow pustules on young wood form cracks; sometimes twigs die. Hard scabs form on fruit—useless for canning. Leaf injury means poor crop next season.

Pest or Disease. (X magnified.)



Methods of Control of Insect Pests and Plant Diseases (illustrated above).

(28) **ORANGE MOTH (Conogethes punctiferalis).**—Spray with Arsenate of Lead when observed.

(29) **PAINTED APPLE MOTH (Teia anartoides).**—Attacks fruit trees, also garden plants and shrubs. Spray with Arsenate of Lead, same as for Codling Moth (see No. 11).

(30) **PEAR PHYTOPTUS OR PEAR-LEAF BLISTER MITE (Phytoptus pyri).** — Spray in spring, when buds commence to swell, Red Oil, 1-25, or Lime-Sulphur: the latter assists in checking Black Spot.

(31) **PHYLLOXERA (Phylloxera vastatrix).** —Plant Phylloxera resistant vines.

(32) **POTATO BLIGHT [Irish] (Phytophthora infestans).** — Spray with Bordeaux Mixture, 8-10-40. Commence spraying when the plants are from 4in. to 6in. high, and continue to spray every 10 days or two weeks, making in all five or seven sprayings. Use at least 80 lbs. pressure to the square inch, and the three-nozzle arrangement, so that the spray will be thrown each side as well as on top. For Potatoes, use clean seed dipped in Formalin.

(33) **POWDERY MILDEW (Podosphaeria leucotricha).**—In winter, prune off and burn infected shoots. Spray with Lime-Sulphur, 1-30, between open cluster and pink stage; Precipitated Sulphur, 10-100, at petal fall, and again (with the last-named spray) early in January. If disease is troublesome, middle of February.

(34) **PEACH RUST (Puccinia pruni).**—Spray Bordeaux, 6-4-40, at the pink bud stage and follow with Dry Mix Lime Sulphur as for Brown Rot.

DUSTING.

The method of dusting trees with insecticides and fungicides instead of, and in addition to, spraying, has met with favor. Points claimed in favor of dusting are its efficacy, ease of application, and consequent saving of labor; the dual application of powdered insecticides and fungicides in one operation.

In vegetable and flower culture dusting is quite an accepted practice.

CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

Red Mites, Bryobia, Etc.—The young mites are red, becoming brownish when fully grown. This species is larger than the common so-called "Red Spider." Eggs red, globular, these are often deposited on young fruit spurs and garden foliage.

Red Scale of Orange.—A small reddish brown scale insect; attacks fruit, leaves and branches, also Roses and garden shrubs; spreads very quickly.

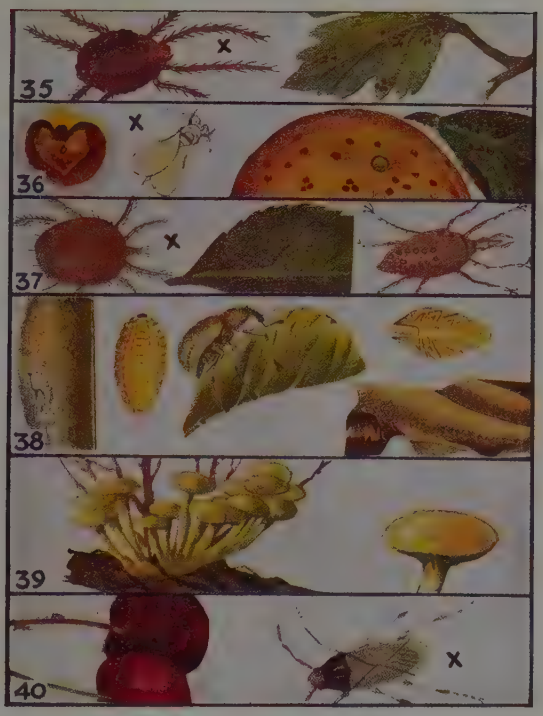
Red Spider.—The sap is sucked by numbers of these insects from the leaves, causing them to turn yellow. It is difficult for the amateur to locate the pest until a certain amount of damage is done.

Root Borer.—The grub attacks trees by tunnelling along the roots, and the beetle by eating the leaves. The beetle climbs the tree, fastens the leaves together with a gluey substance, and then lays her eggs. When hatched the young grubs drop to the ground and feed on the roots. The pest usually appears on the leaves for feeding in the spring.

Root Rot (Armillaria Mellea).—A destructive root fungus, which attacks all fruit trees and many garden plants.

Rutherglen Bug.—These plant bugs insert their beaks or rostrums into the fruit and extract the juice, causing the fruit to wither, become dry, and perfectly useless; they also attack flowers and vegetables, sucking the sap and causing the plants to wither. Usually appear in the summer.

Pest or Disease. (X magnified.)



Methods of Control of Insect Pests and Plant Diseases (illustrated above).

(35) **RED MITES, BRYOBIA, Etc. (Bryobia pratensis).**—They attack fruit trees, also garden plants, flowers, vegetables, etc. Spray with Lime-Sulphur or Red Oil, 1-20, when buds commence to swell. If mites are present on leaves in summer, spray with White Oils or Nicotine Solutions, Clensel, etc.

(36) **RED SCALE OF ORANGE (Aonidiella auranti).**—Spray same as for Lemon Leaf and Peel Scale. When young are hatching in summer Tobacco Sprays could be used. Fumigate.

(37) **RED SPIDER (Tetranychus telarius).**—Same as for Red Mites. (See No. 35.) For Red Spider on beans spray as above or dust with finely powdered sulphur.

(38) **ROOT BORER (Leptops squalidus).**—Attacks Apples, Pears, vines, etc. Place a 3½in. zinc band round tree trunk 18in. from ground. Destroy all beetles observed. Keep orchards clean in the spring, as the insects lay their eggs on weeds, leaves, or suckers. Spray with Arsenate of Lead. Hymenopterous (wasp) parasites are valuable. Jar the trees over a blanket; gather and destroy the beetles.

(39) **ROOT ROT (Armillaria mellea).**—Remove and destroy affected trees in order to prevent the disease spreading and dress the soil with Sulphate of Iron and Quicklime before replanting.

(40) **RUTHERGLEN BUG (Nysius vinitor).**—Spray with Benzole Emulsion, Nicotine Solutions or Clensel, when the bugs appear in young state. Apply Pyrethrum or Nicotine Dust. Keep down weeds. Smudge fires will drive them away from orchards.

Mealy Bug (Pseudococcus longispinus).—Small destructive insects, light yellow to grey, covered with powdery substance. Spray with tobacco preparations, or benzole emulsion.

Pear Root Aphis (Eriosoma pyricola).—Closely allied to woolly aphis; the former works entirely underground. Scatter paradichlorobenzine (P.D.B.) on surface of soil and dig in, or place in hole 6 in. deep excavated around tree. Use 3 to 10 oz. P.D.B., according to size of tree. Dip young trees before planting in tobacco water or red oil solution.

The **Dicky Rice Weevil** attacks citrus trees. Spray with arsenate of lead, 1-20, as soon as observed (generally early in November).

CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

San Jose Scale.—Attacks fruit trees—Pear, Apple, Cherry, Plum, Apricot, etc., also Roses, shrubs and hedge plants. A small scale insect of light orange color; attacks trunk, limbs, foliage and fruit. Is very destructive. When Apples and Pears (fruit) are attacked, light red rings appear on the fruit around the scales.

Scab of Orange and Lemon.—Lemon Scurf, dingy white scurfy patches. Grey scab of Orange, the patches are flat, almost round, and break up into minute flakes. Greyish-brown scab of the Lemon occurs on both ripe and green Lemons. False Melanose is another form of scab.

Shot Hole.—Attacks blossom, leaves, twigs and sometimes fruit of Apricot, Cherry, Plum, etc. Blossom infection looks like frost injury. Leaf infection occurs very early, often reducing leaves to skeletons. Gum often exudes from ruptured bark. Scabbiness appears on Apricot fruit.

Slug of Pear and Cherry.—The larvae attack the leaves, doing serious mischief by devouring the skin of the upper side of the leaf. The underside is left untouched, and turns to a deep brown color. They attack the tree mainly in late spring, when the foliage is young.

Strawberry Beetle. — In November and December these insects do most damage; the beetle attacks the leaves and flowers, and the larvae bores into the plant.

Thrips.—One of the worst insect pests. All kinds of fruit, flowers and vegetables, especially Onions, are attacked.

Tomato Moth.—The eggs of this moth are deposited on leaves and stem. The young larvae crawl up the stem and eat their way at once into the flesh, which is destroyed. There is scarcely any limit to the number of plants this pest will attack, cereals, maize, vines, garden plants, etc.

Pest or Disease. (X magnified.)

Methods of Control of Insect Pests and Plant Diseases (illustrated above).

(41) **SAN JOSE SCALE (Aonidiella perniciosa).**—Burn all prunings promptly. Spray in late winter with Red Oil, 1-20 or Lime-Sulphur, 1-10. In summer, when scales are moving, spray with White Oils or Nicotine.

(42) **SCAB OF ORANGE AND LEMON.**—As this disease attacks new growth, spray with Bordeaux (3-3-50), to which has been added 1 per cent. of Red Oil, before the new growth begins.

(43) **SHOT HOLE (Coryneum Beijerinckii).**—Spray Bordeaux, 6-4-40, before leaves fall in autumn; 6-4-40 at "pink" stage. Use lime casein spreader with the Bordeaux mixture.

(44) **SLUG OF PEAR AND CHERRY (Caliroa limacina).**—Cherry, Peach, Quince, Plum and other trees are attacked. Spray with Arsenate of Lead. The first spray for Codlin usually kills the Pear Slug. Spray unbearing trees or Hawthorn hedges if necessary. Dust with lime, powdered Lead Arsenate, Sulphur, ashes, or sand.

(45) **STRAWBERRY BEETLE (Rhinaria perdix).**—Spray with Arsenate of Lead before fruit is ripening. As a deterrent, spray with Benzole Emulsion.

(46) **THRIPS.**—When not in plague numbers, thrips do not seriously affect fruit crops. Scientific investigations prove that plague infestations as well as freedom from the pest, can be forecast from the numbers of insects present in the autumn and early spring. Pyrethrum and derris dusts kill thrips and act as repellants for two days with each application.

(47) **TOMATO MOTH (Heliothis armigera).**—Use poisoned baits, bran and arsenic, also Arsenate of Calcium. Spray with Arsenate of Lead or dust with powdered Arsenate of Lead. Keep soil around plants well forked.

FUMIGATION.

Fumigation with Hydrocyanic Acid Gas kills red scale of citrus trees and various other scales and pests. Tents are placed over trees, calcium cyanide dust, 1 oz. per 100 cub. feet, is forced in by means of a hose and blower. On being released to the air hydrocyanic acid gas is formed. This has largely superseded the "pot" method of mixing cyanide, sulphuric acid and water.

Fumigation is done (on still nights) from late December to early June; the temperature should not be below 50 deg., and humidity should not exceed 80 degrees.

CLASSIFIED INDEX OF ORCHARD PESTS AND DISEASES (Continued).

Description of Pests as Illustrated.

Transit Rot.—Attacks fruits only through skin injury. It appears as a cottony mould, at first white, but quickly changing to black. The fungus produces a rot which at first is brown and quite firm; then the cells rapidly break down and the fruit becomes a watery mass.

Vine Hawk Moth (Silver Striped).—The caterpillar of this moth strips the vines of their leaves in a very short time, even quicker than the caterpillar of the Vine Moth.

Vine Moth.—The caterpillar, or larvae, of this moth attacks the leaves and young Grapes, also Virginia Creeper, and will very quickly denude the vines and creepers of their foliage.

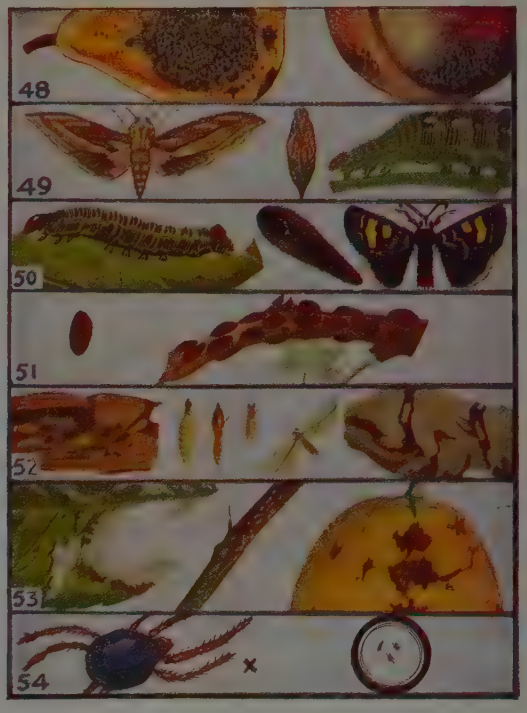
Vine Scale.—One of the largest scales infesting plants. Attacks vines, Jap. Plums, etc. This scale has become a pest in flower gardens. Many kinds of creeping plants, viz.:—Tacsonia, Mandevillea, Cobaea, etc., being attacked.

White Ants. — This destructive pest attacks timber trees, vines, Apricot, Orange and Peach trees, also furniture, etc.; is a very serious enemy.

Wither Tip of Orange and Lemon.—Often called "Dieback," as twigs die from the top downwards. ("Dieback" of Apple trees may be associated with this disease.) On the undersurface of the leaf whitish grey blisters arise. The leaf withers at the tip and is gradually destroyed; blotches appear on stem.

Pea Mite.—A serious pest. The body of this mite is dull blue. They have rather long red legs. They run very rapidly when disturbed, and soon get out of sight, hiding in crevices or under lumps of earth.

Pest or Disease. (X magnified.)



Methods of Control of Insect Pests and Plant Diseases (illustrated above).

(48) **TRANSIT ROT (Rhizopus nigricans Ehr., Rhizopus arrhizus Fisch).**—Handle fruit carefully, preventing skin injury. Sterilise cases in boiling water. Spray shed interiors and all woodwork with 1 lb. bluestone to 5 gallons water. After picking and packing, pre-cool fruit immediately for two days at 35 deg. F., and transport to market in iced insulated trucks or louvre trucks.

(49) **VINE HAWK MOTH, SILVER STRIPED (Chærocampa celerio).**—Spray with Arsenate of Lead, whenever observed.

(50) **VINE MOTH (Phalænoides glycine).**—Spray with Arsenate of Lead, whenever observed. Keep soil at the foot of the vines worked up to destroy chrysalids in soil.

(51) **VINE SCALE (Eulecanium persicae).**—Sprays same as for Olive or Black Scale. Spray in summer with Tobacco extract when young are observed.

(52) **WHITE ANT OR TERMITE (Termes lacteus).**—Apply Manurial Insecticides to roots. Apply Paris Green dust to the runs. Inject Carbon Bisulphide if nests located.

(53) **WITHER-TIP OF ORANGE & LEMON (Phoma omnivora).** — Prune out all diseased wood and spray with Bordeaux Mixture (6-4-40) or Copper Soda (6-9-40).

(54) **PEA MITE (Penthaleus major).** — Attacks Peas, Onions, Potatoes, Beans, Beet, etc., also flowers. When mites appear, plough deeply and destroy all weeds, particularly Capeweed as the mites breed on these. They will not live for any length of time on clean cultivation, but fairly quickly migrate across it from pasture paddocks, dirty headlands, etc. Any plot freed from mites by cultivation or other treatment may be kept free by placing a trail of Creosote, or a mixture of Kerosene and Phenyle, about four inches wide, right across the plot. The mites will not be able to cross this for a few weeks.

Take 1 part of Carbolic Powder (15 per cent.), 3 parts Lime, Super. or Gypsum, and broadcast over the plants, and work into soil at the rate of 2 cwt. per acre.

Tobacco Dust and Lime in equal quantities have been used in a similar way with some success by market gardeners. Manurial Insecticide used at the rate of 1½ to 2 cwt. to the acre has also been fairly effective in some parts.

Spray with Nicotine solutions.

Dust with Nicotine and Creosote dust.

EDITORIAL

SINCE OUR LAST "Annual" conveyed its interesting information to readers, the enemies of civilization have been defeated, and now the whole world is groping its way back to the paths of peace. It is evident that much remains to be done to achieve peace—and we trust a lasting peace. There are some sore spots in the world to-day. This is not the place to discuss political implications, as views thereon differ so widely. This can be said, however, that we all need to entertain the broadest sympathies, and to approach all happenings open-mindedly and in a spirit of good will. What each of us thinks is important as it goes to make up the body of opinion which decides the destinies of nations. We must not make the error of forming snap judgments on matters on international import, nor be guided unduly by scare headlines in the daily press. There is a broad stream of history on which we do well to ponder.

It has been noted that in some quarters—though least of all among the country population—there has been a tendency to airily wave aside proposals for a "new world" order. We do not need nostrums, for sure, but we do need to think deeply on national and international affairs, keeping an open mind and endeavouring to develop a programme for doing away with the horrors and needless suffering of war with its harvest of sorrow, disease, death and wasted lives and effort. Perhaps the time is nearer than some think for the development of the co-operative spirit, which while providing full scope for individual initiative will sublimate undue acquisitiveness —this to be applied personally, nationally and internationally.

Just now, much thought is being given to the implications of the Bretton Woods Agreement, with its effect on exchange and international trade, also to the other World Conferences, the decisions of which have such a direct bearing on the future policy and development of Australia.

As pointed out elsewhere in this Annual, Australia is facing a difficult situation in relation to British-American relations, with which is bound up the matter of Empire Preferences. Certain it is that the irrigation policy of this country has been built up on the Empire Preference programme, and that, or its equivalent, will be needed if our primary industries which produce for export are to survive.

Just now an urgent matter is that of assistance to Britain in her plight owing to food shortage. Doubtless people of many other nations are hungry, too, and it is a hopeful sign that there are not lacking, people of goodwill who are ready to assist in relieving distress.

It is certain that the call to assist the Motherland in this her hour of need, will not go unheeded, All sections of the Australian fruit industry may be relied upon to do all that is humanly possible.

Coming now to matters nearer home, it is of profound interest that plans are in hand for the unification of the Australian railway gauges. This is long range policy, and will have beneficial effects on this young nation; this enterprise will be of particular value to the fruit and vegetable industries.

It is also observed that the Federal and State Governments are deeply interested in the subject of water conservation and the prevention of soil erosion. Some bold national projects have been suggested from time to time, not the least of which is what has been termed the "Bradfield" plan for the utilisation of the coastal streams which now empty into the sea: by turning the waters inland, thus to develop our natural resources and make it possible for Australia to carry a much larger population than at present.

The Federal and State Departments of Agriculture, also the Council for Scientific and Industrial Research, are to be congratulated on their valued horticultural research, which includes plant breeding, manuring, cultivation, pest and disease control, and many allied subjects. However, much more remains to be done, and probably compost-making and plant breeding are of outstanding importance.

Market Research.

One very important matter to which the fruit industry could give attention is that of market research. It is probably true that some branches of the industry—notably the dried fruit section—have made considerable progress in this direction. It is quite certain that some other branches of the industry need this service greatly. It is a field of research which is practically untouched. The need is very great for a thorough examination as to the market capacity of the cities and towns, with regard to quantities and varieties, the effect of the cost of vegetables on the purchase of fruit by housewives; packages, the "conditioning" of Pears, improvements in retail trading, and many other topics.

The principal purchasers of fruit and vegetables are the masses of the population, and here we come to the vexed question of the basic wage. It was certainly a strange omission when the original basic wage was computed that no provision was made for the purchase of fruit and vegetables.

It should be noted that recent research has demonstrated the necessity for the inclusion of adequate quantities of fruit and vegetables in the daily diet. This fact is emphasised by the medical and dental professions, also dietitians. However, in the welter of advertising of denatured foods and patent medicines, the truth about the nutritive qualities of fruit and vegetables needs to be told and told continuously.

The Editor and Staff send greetings to all readers.

Much of interest will be found in the articles in this Annual, and readers are invited to continue the themes herein set forth, and other matters by writing to the Editor, for the publication of letters in the monthly issues of the "Fruit World."

The AUSTRALIAN Fruit Industry

Production and Area
All Sections of Industry Reviewed

FRUITGROWING COMMENCED IN AUSTRALIA with the arrival of Governor Arthur Phillip at Port Jackson in 1788. Some seeds and plants of Apples, Pears, Figs, Oranges, also Grape vines had been brought by the First Fleet from the Cape of Good Hope. While the records are dim concerning the fate of these early plantings, we do know that Apple trees were planted in 1792 at Bruni Island by Lieut. Bligh.

Records also show that early in the 19th century, Apples and Pears were being successfully grown at Sydney Cove, N.S.W. Subsequently, John Pascoe Fawkner established a fruit tree nursery at Launceston, Tasmania, from trees grown at Sydney. Some of these trees were purchased by Edward Henty for growing at Portland, Victoria: this was early in the 1830's.

While it is on record that Lieut. Grant had planted Apple seeds at Phillip Island, Victoria, in 1801, it was not until 1837 that fruitgrowing really commenced in Victoria, when Fawkner brought between 2,000 and 3,000 Apple trees from Launceston and planted an orchard in South Melbourne.

Fawkner subsequently established a nursery at Pascoe Vale, near Melbourne, and sold trees to the public.

About the time Fawkner was planting his South Melbourne orchard, developments were taking place in Tasmania. Apple trees were planted at York Town, Tamar River, Tasmania, by Lady Franklin, wife of Sir John Franklin, then Governor of Tasmania. Some of these old trees are still growing. Then fruitgrowing was established in the South of the Island, and Tasmania has since become the principal Apple-growing State of the Commonwealth. Tasmania is also the home of the berry fruits industry.

A Statutory body: the Tasmanian State Fruit Board has been set up: this is financed by a levy of 1/- per acre of Apple and Pear orchards.

Tasmania usually supplies about two-thirds of the Apples exported from Australia. During the war, when exports were prohibited, a new Apple processing industry was developed, and now Tasmania turns out large quantities of canned and dried Apples, Apple butter, Apple juice—as well as many other pure fruit juices.

In New South Wales, following the crossing of the Blue Mountains and the discovery of suitable areas for fruit culture, the industry developed, and to-day that State grows more Oranges and Bananas than any other in the Commonwealth.

Apples and Pears are grown in many districts of N.S.W., but the principal centres are around Batlow, Orange, and Armidale.

Bananas and Pineapples are grown in the fertile areas of the northern rivers and on towards the Queensland border. In the Murrumbidgee Irrigation Areas, Peaches and many other fruits are grown. The Leeton cannery is one of the most important in the Commonwealth. Oranges are grown in this and other irrigation districts.

Queensland is the principal State for growing Pineapples and tropical fruits. At the fruit cannery near Brisbane, large quantities of canned Pineapples and Pineapple juice are produced. Under legislative enactments growers are organised into groups according to the fruit produced, with power vested in the Committee of Direction of fruit marketing on which all sections of the fruit industry are represented.

Victoria leads all other States in the production of dried vine fruits—the yields being approximately half of the potential tonnage of 100,000 tons annually. The principal producing areas under irrigation in the Murray Valley.

The canning of fruit (particularly Peaches) is also a major enterprise, particularly in the Goulburn Valley under irrigation.

With a total of around 112,000 acres under fruit and vines, Victoria is the leading fruit producing State of the Commonwealth.

For acreage under vineyards, South Australia holds the record for the Commonwealth, and this State is the chief wine producer.

Apart from wine Grapes, however, large quantities are used for dried fruits and for dessert. South Australia produces the full range of pome, stone, citrus and

berry fruits. There Almonds are produced in larger quantities than in any other State.

Fruit and vegetable growers are well organised in a co-operative distributing society.

Western Australia commenced her commercial fruit production a few years prior to the outbreak of World War No. 1. Certainly fruit of all kinds (excepting the Banana) was grown in the Western State for many years prior to that time. Now, Bananas are being grown and the industry is capable of expansion.

The Apple and Pear districts of the South-west and other places prospered and now W.A. is in the premier position regarding export, the highly coloured, firm, well-flavoured fruit being the last into the ship and the first out.

The co-operative movement is firmly established among producers for the cool storing and handling of their produce, also in the supply of requisites. The W.A. Fruitgrowers' Association (financed by means of a levy) is an effective body.

The production of Oranges is around 400,000 cases annually.

Western Australia has been kept free from the codling moth and black spot (Venturia inaequalis) by ability and energy.

Area Under Fruit.

Statistics giving the area under fruit in all the States for the season 1943-44 were given in the 1945 edition of the "Fruit World Annual." Later figures were not available at the time of this edition going to press, but it is understood that there have been no major changes, hence the 1944 figures are repeated only of the main lines of production.

VINEYARDS—AREA AND PRODUCTION, 1944-45.

	Area. Acres.	Table. Grapes.	Production in Tons. Raisins.	Currants.	Wine Gallons (a).
N.S.W.	15,891	4,363	5,053	1,064	2,000,000
Victoria	43,031	(a) 4,000	32,851	6,817	1,000,000
Queensland	2,992	2,215	—	—	25,000
South Australia	56,925	917	12,445	6,969	9,250,000
West. Australia	10,123	2,908	674	2,892	500,000
A.C.T.	2	—	—	—	250
Total	128,964	14,403	51,023	17,742	12,775,250

(a) Forecast.

AREA UNDER FRUIT, ALL STATES, SEASON 1944-45.

The following table shows the area under the different varieties of fruit in all States:—
(Figures supplied by Commonwealth Statistician.)

Fruit.	N.S.W. Acres.	Vic. Acres.	Q'land. Acres.	S. Aust. Acres.	W.A. Acres.	Tas. Acres.	Australian Capital Territory. Acres.	Total. Bearing and Non-bearing. Acres.
Apples	14,650	22,360	5,513	7,802	12,738	22,889	66	86,018
Bananas	12,868	—	7,457	—	185	—	—	20,510
Citrus—								
Oranges—Navel	8,439	2,236	1,028	2,696	1,650	—	—	16,049
Valencia	11,669	1,721	1,037	995	1,452	—	—	16,874
Other	1,840	287	956	315	99	—	—	3,497
Mandarins	2,857	102	1,798	124	187	—	—	5,068
Lemons	3,443	1,919	489	356	538	—	—	6,745
Other	838	236	439	147	172	—	—	1,832
Passionfruit	684	178	147	—	122	—	—	1,131
Pineapples	193	—	6,940	—	—	—	—	7,133
Papaws	12	—	1,194	—	—	—	—	1,206
Peaches	8,287	14,854	1,494	1,361	813	131	6	26,946
Pears	3,524	13,504	404	1,689	933	2,381	7	22,442
Plums	2,242	3,019	1,187	711	853	336	8	8,356
Prunes	2,653	491	39	1,098	48	46	1	4,376
Raspberries	—	159	—	56	—	2,095	—	2,310
Strawberries	4	241	125	100	6	454	—	930
Other Small, N.E.I.	12	204	—	187	8	2,283	—	2,694

The area under all fruits (except vines) in the several States in 1943-44 were (in area): N.S.W., 81,283; Vic., 70,024; Queensland, 31,928; S. Aust., 25,521; W. Aust., 21,154; Tasmania, 32,135; Fed. Capital Territory, 105. Total, 262,150.

PRODUCTION, ALL FRUITS, BY STATES, SEASON 1944-45.

The total production of all fruits (other than vine fruits) is shown below, expressed in quantities as ordinarily recorded, by States:—

Fruit.	Unit of Quantity.	N.S.W.	Vic.	Qld.	S. Aus.	W.A.	Tas.	A.C.T.	Total.
Apples	bushel	501,378	1,138,801	173,555	617,361	1,452,030	6,822,098	1,012	10,706,235
Apricots	„	99,968	366,000	10,652	249,065	35,194	119,778	43	880,700
Bananas	„	1,426,192	—	511,727	—	19,077	—	—	1,957,056
Cherries	„	146,460	52,929	(c)	59,676	415	8,917	11	268,408
Citrus—									
Oranges—									
Navel	„	995,396	338,985	92,619	630,856	156,417	—	—	2,214,273
Valencia	„	1,190,534	227,119	92,883	149,662	154,947	—	—	1,815,145
Other	„	160,400	36,747	80,431	43,734	13,155	—	—	334,467
Mandarins	„	193,355	15,962	185,897	17,113	15,302	—	—	427,629
Lemons	„	333,967	100,397	57,069	32,048	81,782	—	—	605,763
Other	„	122,816	44,605	56,427	18,341	17,062	—	—	259,251
Custard Apples	bushel	249	—	29,206	—	—	—	—	29,455
Figs	„	13,743	11,537	(c)	19,596	11,096	—	5	55,977
Mangoes	„	755	—	36,678	—	19	—	—	37,452
Nectarines	„	30,095	24,011	(c)	24,448	13,019	729	—	92,312
Nuts	lb.	136,423	219,325	77,198	1,132,880	36,479	1,990	6	1,604,301
Olives	cwt.	83	2,157	(c)	1,678	3	—	—	3,921
Passionfruit	bushel	16,296	6,254	3,964	—	4,716	—	—	31,230
Pineapples	dozen	19,896	—	1,570,990	—	—	—	—	1,590,886
Papaws	„	1,848	—	281,689	—	13	—	—	283,550
Peaches	bushel	501,059	1,404,870	70,106	132,184	54,465	8,185	25	2,170,894
Pears	„	570,609	1,750,802	16,120	213,021	118,106	594,463	19	2,963,140
Persimmons	„	5,394	(b)	(c)	—	305	—	—	5,699
Plums	„	121,982	156,391	52,009	58,906	58,904	50,980	42	499,214
Prunes	„	119,389	33,700	992	59,313	1,793	7,813	—	223,000
Quinces	„	21,666	61,532	(c)	28,956	3,845	7,261	22	123,282
Raspberries	cwt.	—	2,950	—	1,155	—	82,179	—	86,284
Strawberries	„	18	3,561	2,151	1,542	345	6,200	—	13,817
Other Small, N.E.I.	„	114	5,440	—	2,017	74	14,690	—	22,335
All Others, N.E.I.	bushel	913	—	11,107	2,970	9,078	—	—	24,068

(a) Subject to slight revision; (b) Not collected; (c) Included with All Other

The Gas Storage of Apples

By G. B. Tindale, B.Agr.Sc., Cool Storage Research Officer, Victorian Dept. of Agriculture

BEFORE the war, many stores were erected in England for the gas storage of Apples, for by that method of storage Apples can be kept longer than by the orthodox method of cool storage.

Now that the war is over, many Victorian Apple growers are anxious to erect stores on their own orchards for storing their Apples, while various co-operative stores are desirious of making additions to their cool stores. Most growers are aware of the development of gas storage in England, and are anxious to install the most modern plant here, and the writer has frequently been asked to advise on the practicability of gas storage of Apples under Victorian conditions.

While gas storage has been most successfully applied in England, yet it must be remembered that the varieties grown there are different from those grown in Victoria, while in addition the growing conditions which profoundly affect keeping qualities are also very different.

For several years past, however, gas storage experiments with Victorian-grown Apples have been proceeding in Melbourne, and it is now possible to offer some advice to those contemplating this method of storage.

What is Gas Storage?

Gas storage is not some entirely different method of storage which dispenses with the orthodox method of cool storage, but is merely a modification of the latter. In gas storage the same low temperatures are required as for cool storage, but the chambers have to be made gas-tight. When the gas chamber is filled with Apples the carbon dioxide (CO_2) respired by the fruit during the living processes accumulates, and when once it has accumulated to the extent of 5 per cent., it is held at that level by opening and adjusting ventilators connecting with the outside air. If too much CO_2 accumulates, a disorder known as Brown Heart will develop. As the evolution of CO_2 by the fruit depends on temperature, most CO_2 is produced immediately after the fruit is shut up in the gas chamber, and before it is cooled down. Usually, the 5 per cent. level of CO_2 is built up within the few days it takes to cool the fruit down to the holding temperature, which temperature varies according to the variety of Apple being stored. This aspect of the subject will be discussed in greater detail later. Several of the main varieties as grown in Victoria have been cool stored in various concentrations of CO_2, and with certain reservations (to be explained later) all varieties have kept much better in 5 per cent. CO_2 than in air at the same low temperature. The gas-stored Apples retained their appearance and flavour much better than when air-stored, they were more crisp and juicy and probably on account of the high humidity prevailing in the gas chamber, they showed practically no shrivelling which may become very serious after long storage in an ordinary cool store.

It is particularly desired, however, to stress the fact that losses due to the onset of disorders may be much greater in gas storage than in air storage and the success of gas storage really lies in the ability of the operator to select his fruit and adopt a technique of storage temperatures so that losses of the breakdown type may be avoided. As the result of several years' experimental work, it is now possible to advise growers how such losses may be overcome.

The Apple varieties as grown in Victoria may be conveniently divided into two groups: (a) those not normally subject to Breakdown in cool storage, and (b) those commonly subject to Breakdown in cool storage. Included in group (a) are the Granny Smith, Democrat, Yates, and, to a lesser extent, Rome Beauty, while in group (b) are the Jonathan, Delicious, King Cole, and, to a lesser extent, the Stewart variety.

The varieties in group (a) not susceptible to Breakdown, store best at the lowest possible temperature without freezing, i.e., at 29 deg.-32 deg. F., and may be stored with Pears which are best stored within that range of temperatures. When air-stored within this temperature range these varieties will keep in splendid condition until December. When gas stored in 5 per cent. CO_2 within the same temperature range, they will keep even better. There is little point, however, in keeping Apples beyond December after which the new season's Apples appear on the market. However, high quality Apples are very scarce on the November-December market, and it is suggested that there is a good opportunity to gas store Granny Smith Apples and cater specially for the November-December market.

Of the varieties in group (b) subject to Breakdown in cool storage, the Jonathan and Delicious are the most important and are the most sought after dessert Apples as grown in Victoria. Unfortunately, however, these varieties have a very much shorter cool storage life than those varieties in group (a) quite apart from their susceptibility to Breakdown, and after September, high quality Jonathans and Delicious are very scarce.

By gas storage, however, the storage life of these varieties can be considerably prolonged, and it would seem that there is a good opportunity to gas store, say, Jonathans and cater for the October-November trade. In order that the Jonathans may be gas stored until then without the onset of Breakdown it is necessary to specially select the fruit, and then to adopt a certain technique of storage temperatures.

It has been found that Breakdown in susceptible varieties is related to size, Apples of 2¾in. size and over being particularly susceptible. For gas storage the size should be limited to 2½in. It has been found, too, that with advancing maturity, susceptibility to Breakdown increases, and Jonathans intended for gas storage should not be more advanced than a green-yellow ground colour. Storage temperature also profoundly affects susceptibility to Breakdown, and it has been found that by storing Jonathans at 36 deg. until the end of April, at 34 deg. during May, and at 32 deg. thereafter losses by Breakdown in this variety may be almost eliminated. Where Jonathans have been selected as above for size and maturity and gas stored in 5 per cent. CO_2 under the above technique of storage temperatures, they have kept in almost perfect condition until December.

In addition to Breakdown, all varieties except the wholly red varieties are very susceptible to Superficial Scald when

gas stored. This may be overcome, however, by wrapping the Apples in oil wraps prior to storage.

Provided the above points are borne in mind, it would seem that the gas storage of Victorian-grown Apples, especially for the end of the year trade, can be recommended.

In the practical application of gas storage there are, however, some difficulties. Apples in gas chambers cannot be given the normal routine inspections, first because in opening the chamber door the CO_2 would be lost, and, secondly, 5 per cent. CO_2 is far too high a concentration for a person to withstand. The method, too, would not be practicable in the large co-operative stores where growers are constantly withdrawing their fruit for marketing. The solution would seem to be the erection of small gas chambers to be quickly filled with, say, one variety of Apple, and after filling seal the chamber and from then on control the CO_2 at the 5 per cent. level, and the temperature at that degree most suitable for the variety. As the CO_2 produced by the fruit depends on the temperature of the fruit, evolution of gas will be very high during the first few days before the fruit is cooled down and usually a concentration of 5 per cent. will be built up during the cooling down period.

If it is decided to start marketing the fruit in the gas chamber in, say, November, the chamber would then be opened up, but the low temperatures would still be maintained, so that it would then merely change from a gas store to an air store.

List of Australian Cool Stores

Victoria.

	Capacity in Bushel Cases
Shepparton Cannery	200,000
Govt. Cool Stores, Victoria Dock	190,000
Orchardists' Co-op., Doncaster E.	143,000
Australasian Jam Co.	120,000
Metro-Ice and Fresh Food Co., Melb.	100,000
Harcourt	80,000
Kyabram Preserving Co.	63,000
Mrs. M. Dalley, Shepparton	60,000
Blackburn	55,700
Amalgamated Freezing Co., Bendigo	55,000
Amalgamated Freezing Co., Donald	55,000
Ardmona Cannery	53,000
Ringwood	51,500
Northcote Ice and Cold Storage Co.	50,000
Burwood E.	42,000
Wantirna	41,000
Dilworth's, Ivanhoe	40,000
Woodmason, W. (3 stores)	40,000
Doncaster W.	40,000
Hastings	39,000
Tyabb	38,200
Red Hill	38,200
Valley View, Pakenham	35,000
Doncaster E.	31,500
Lawford's Fruit Ex.	31,070
Mt. Waverley	30,600
Sennitt's, Melb.	30,000
Box Hill Cold Storage Co.	30,000
Brighton Ice Works (increasing to 50,000)	25,000
Somerville	23,500
Holland, J. E., Red Hill	23,000
Floyd's, Moonee Ponds	22,500
S.Vic. Pear Packing Co., Blackburn	21,110
Croydon	21,050
Lawford, V., Blackburn	21,000
Angliss & Co., Melb.	20,000
French, Deepdene	20,000
Templestowe Cool Stores Pty. Ltd.	20,000
Pyke, F. C., Ringwood	20,000
Diamond Creek	18,700
Brunning, J., & Sons, Somerville	17,500
Graceburn Valley, Healesville	17,000
Narre Warren Co-op. Stores	16,560
Devon Orchards, Red Hill	15,000
Brunswick Ice Works	15,000
Gorae Stores, Portland	15,000
Vic. Butter Factory, Melb.	15,000
Pakenham Cool Stores Pty. Ltd.	14,200
Unthank, H. H., Hastings	14,200
Peninsula Cool Stores, Moorooduc	13,700
Petty, F., Mitcham	14,000
Ireland, A. E., Doncaster	14,000
Tully, L. J., Doncaster	14,000
Ireland, W., Mitcham	13,500
Toomuc Valley, Pakenham	13,000
Burriss Ice Works, Glenferrie	12,000
Symes, H., Harcourt	11,600
Carpenter Bros., Hastings	11,500
Richmond Ice Works	11,000
Dobson Bros., Fern Tree Gully	10,080
Antarctic Ice, Warrnambool	10,000
Crystal Ice Co., Bendigo	10,000
Heatherlea, Croydon	10,000
Stott, A. P., Wheeler's Hill	10,000
Lowe, W., Officer	10,000
Petty, Mrs. A., Doncaster	10,000
Hyland & Sons, Melb.	10,000
Robinson, H. W., Donvale	9,500
Aust. Ice Works, Ballarat	8,000
Cameron, F. W., Doncaster	8,000
Polar Ice Products, Geelong	7,500
Spurr, W., Bacchus Marsh	7,000
Tynong (W. C. Thomas & Co.)	7,000
Thiele, A. C. H., Doncaster	7,000
Silk Bros., Melbourne	7,000
Lechte Bros., Mt. Waverley	6,150
Bunyip Orchardists	6,118
Jenkins, A. S., Scoresby	6,000
Apted, L., Arthur's Creek	6,000
Motschall Bros., Panton Hill	6,000
Robinson, J., Scoresby	6,000
Bairnsdale (Lekeland Butter Co.)	6,000
Gedye, R. T., Doncaster	6,000
Corbett, H. P., Doncaster	5,500
Heinz Bros., Ballarat	5,500
Haysey, R. E., Narre Warren	5,300
Burke, P., Hurstbridge	5,000
Preston and District Ice Works	5,000
Jenkins, W. R., Templestowe	5,000
Onleys, Brunswick	4,500
Jenkins, H. D., Scoresby	4,000
Parker, A., Donvale	4,000
Chelsea Ice Works	4,000
Bound & Sons, Nhill	4,000
Burgi, M. L., Wandin	4,000

Dawson, W., Kangaroo Ground	3,600
Priest, G. H., Pakenham E.	3,300
Mordialloc Ice Works	3,000
Shanhun, D., Panton Hill	2,500
Wilson, Chas., Scoresby	2,500
Ramage, A., Pakenham	2,400
Shaw, A. B., Cottlesbridge	2,150
Potter Bros., Bendigo	2,100
Smith, W. T., Panton Hill	2,016
Smith, V. A., Panton Hill	2,016
Robinson, A., Mitcham	2,000
Williams, J. T., Doncaster	1,800
Stone, F. E. H., Panton Hill	1,800
Jones, H. L., Hurstbridge	1,100
Stawell Butter Co., Stawell	1,000
Colac Ice Works	1,000
Muir, M., Red Cliffs	450

QUEENSLAND.

Brisbane.

Birt and Co.	20,000
Hamilton Cold Stores	100,000
Trails Ltd.	16,000

Stanthorpe District.

A. R. Barlow, Applethorpe	10,000
J. W. C. Barlow, Applethorpe	1,400
H. Archibald, Posieres	5,000
H. R. Y. McGuigan, Thulimbah	6,000
W. Paget, The Summit	6,000
R. Clark, Ballandeen	5,000

WESTERN AUSTRALIA.

(Case capacity not available.)

Hollywood Brewery	Perth
Brownes Ltd.	Perth
Richmond Brewery	Fremantle
Boulder Ice Co.	Kalgoorlie
V. P. Webb	Argyle
Macfarlane and Co. Ltd.	Perth
Westralian Farmers Ltd.	Fremantle and Bridgetown
Illawarra Orchard Co.	Karragullen
Mt. Barker Cold Storage Co.	50,000 cases
Western Ice Co.	Perth and Fremantle
Tropical Traders Ltd.	Perth
Perth Ice Works	Perth
Bantocks Ltd.	Subiaco
W.A. Meat Export Co.	Robbs Jetty
Peters' American Delicacy Co.	Perth
Fremantle Cold Storage Co.	Fremantle
Collie Ice Works	Collie
Albany Freezing Works	Albany
Anchorage Butchers Ltd.	Fremantle
Cartwrights Dairy Produce Co.	Perth

FRUIT COOL STORES IN NEW SOUTH WALES.

Capacity in Bushel Cases.

Sydney and Newcastle:	
Municipal Cold Storage Works, Sydney	110,000
N.S.W. Fresh Food and Ice Co. Ltd., Sydney	35,000
Sydney Cold Stores Ltd., Sydney	35,000
Market Cool Stores, Sydney	25,000
Metropolitan Ice and Cold Storage Co., Sydney	5,000
Hyland and Sons Pty. Ltd. (David), Sydney	10,000
Dark's Cool Stores Ltd., Newcastle	65,000
Country:	
W. E. Barrett, Orange	125,000
Batlow Packing House, Batlow	96,000
Orange Fruitgrowers' Cool Stores Ltd., Orange	62,000
Leeton Co-op. Cannery Ltd., Leeton	53,000
Griffith Producers' Co-op. Co. Ltd., Griffith	26,000
W. E. Oldfield and Sons, Queanbeyan	25,000
Young Cool Stores Rural Co-op. Ltd., Young	19,000
Co-op. Cool Stores, Kentucky	16,000
Albury District Rural Co-op., North Albury	11,400
Kentgrove Estate (C. J. Reeves), Goulburn	10,000
R. A. Jackes, Armidale	9,000
Della Valle, F. J., Batlow (increasing to 11,000)	5,000
Riverina Cool Stores' Trading Co., Wagga	5,000
Wallace and Ryan Pty. Ltd., Wagga	4,000
Reg. Swan, Peel Street, Tamworth	3,500
S. E. Ward, Kentucky	3,000
Harris Bros., Little Hartley	2,000
Sim Bros., Brooklyn, via Capertee	2,000
H. Scott, Narrandera	2,000
A. M. Nugan, Griffith (pre-cooling chambers)	2,000
F. J. Westbury, Kentucky	1,600
S. R. Mort, Leeton	1,000
E. Pearson, Chipping Norton	1,000
A. Garnet Davis, Bowral	250

SOUTH AUSTRALIA.

Cool Storage Accommodation for Apples and Pears.

	Bushel Cases.
Producers' Cold Storage Ltd., Adelaide	56,000
S.A. Cold Stores Ltd., Mile End	25,000
Metropolitan and Export Abattoirs Board, Gepp's Cross	53,000
Cudlee Creek Co-op. Society Ltd., Cudlee Creek	31,902
Lenswood Cold Stores Ltd., Lenswood	27,000
Balhannah Cold Stores Ltd., Balhannah	22,500
Gumeracha Fruit Growers' Co-op. Assn., Gumeracha	15,600
Sturt Producers' Scty. Ltd., Blackwood	28,700
Heysen, O., and Son, Adelaide	12,000
Redden, W. J., and Son, Verdun	7,000
Redden, W. J., and Son, Cudlee Creek	6,700
Norsworthy and Co., S. E., Gumeracha	5,000
Norsworthy, P. G., Williamstown	3,200
Kelsey, R., Balhannah	1,856
Laura Ice and Produce Co. Ltd., Laura	1,000
Clare Ice and Cold Stores Ltd., Clare	3,000
Government Produce Department, Adelaide	15,000
Paracombe Fruitgrowers' Co-op. Society Ltd., Paracombe	22,400
Vickers, M. J., Lenswood	7,000
	343,858

TASMANIA.

	Cubic Feet.
*H. Jones and Co., Hobart	225,000
Moonah Cool Stores	60,000
Bender and Co., Launceston	60,000
Pt. Huon Fruit Growers' Cool Store (Co-op.), Pt. Huon	230,000
Huon Deep Water Cool Store, Port Huon	82,500
Huonville Cool Stores	175,000
Cygnet Cool Stores	100,000
Rostrevor Est. Cool Stores, Triabunna	25,000
Beauty Point Cool Stores, Beauty Point	80,000
E. A. Walpole, Spreyton	60,000
W. H. and D. F. Calvert, Judbury	30,000
Calvert Bros., Waterloo	16,000
A. Clark, Koonya	4,000
	1,147,500

Australian Canned Fruits

An Industry of National Importance

Re-establishment of Overseas Trade is Important

THE 19th ANNUAL REPORT of the Australian Canned Fruits Board is an interesting document, which gives much valuable information in relation to the important canned fruits industry of Australia. The report covers the twelve months ended June 30, 1945. It is pointed out that the closest liaison was maintained between the Board, Commonwealth Food Control and the Department of Commerce in connection with the production and distribution of canned fruits, particularly with regard to quotas for the Services, the civilian population and for the overseas trade.

A summary of the report is as follows:—

With the termination of hostilities, it is essential that closer application should be given to the re-establishment of overseas trade than it has been possible to devote to this important task in recent years. Representation in England is important as the U.K. has provided the principal outlet for Australia's surplus production of canned fruits.

Statistics.

It is recommended that a Commonwealth survey be undertaken for the purpose of establishing, and thereafter maintaining, reliable figures of fruit production, insofar as it bears a direct relationship to fruit canning.

The fruit processing industry is sufficiently important, nationally, and its seasonal problems are such as to justify the widest possible information as to fruit tonnages it is expected to handle being readily made available.

Additional to data on varietal plantings and yields in the several areas of production throughout Australia, an important crop reporting service, giving seasonal estimates of fruit tonnages likely to be made available to canneries would be welcomed. A similar service has been operated successfully in the U.S.A., and its establishment here would prove a useful guide to producers' organisations.

This matter could be handled by the recently-created Commonwealth Bureau of Agriculture and Economics.

PRODUCTON.

Apricots, Peaches and Pears.

The heavy service demands against the limited packs in 1944 ensured a complete clearance of stocks, consequently processors entered the 1945 canning season with no unsold stocks on hand.

Maximum production again was officially sought, but despite earnest endeavours, the aggregate pack in these varieties reached the disappointingly low total of 2,080,955 cases—about 75 per cent. of an average pre-war pack.

The canned Apricot pack was 138,631 cases, being substantially short of the 1944 output of 327,946 cases.

The output of canned Peaches was 1,327,758 cases a slight reduction compared with 1944.

Canned Pears totalled 614,566 cases, an increase of 12,366 on 1944—nevertheless, it represents a 75 per cent. pack based on average pre-war production.

There was a slight but increasing interest in processing whole canned Apricots, and a similar interest in diced mixed fruits, usually a combination of Peaches and Pears.

Growers obtained a general increase of 10/- per long ton on 1945 deliveries of canning fruits to factories.

The minimum prices as presented by the Fruit Industry Sugar Concession Committee for 1945 season fruits were:

	Per long ton at growers' loading station or delivery to local factory.
Apricots	£17 0 0
Clingstone Peaches, Clear Centres	16 0 0
Clingstone Peaches, other	15 0 0
Freestone Peaches	12 10 0
Pears, W.B.C.	15 0 0

These rates reflect a very substantial advance on those available to growers in pre-war years. Undoubtedly growers' production costs have increased under war-time conditions, and doubtless the authority nominating prices for factory purchases of fruit has satisfied itself that

advanced rates are justified. Whether prices for fruit can be maintained at their present level in the uncertain trading period which lies immediately ahead is difficult to forecast; much will depend on the ability of Australian processors to successfully compete in overseas markets with the products of other producing countries. There have been substantial increases in the prices for canning fruits in U.S.A., whereas in Australia, the incidence of war-time conditions has undoubtedly had a bearing on this price development. The permanency or otherwise of these advances in value of American orchard yields ultimately will be reflected in the prices which Australian canners can afford to pay for their fruit purchases.

(b) Pineapples.

The 1944 summer pack of canned Pineapples was indicated in the Board's 18th Annual Report as 52,800 cases, one of the lightest experienced in the industry for many years. The winter pack was also exceptionally light, yielding only 57,998 cases. The aggregate 1944 pack therefore was 110,798 cases, being the lowest since 1931.

Service demands were again heavy, the pack being quite inadequate to fully meet them.

Growers received a sharp rise for fruit supplied to canneries from their 1945 summer crop, the minimum price authorised by the Fruit Industry Sugar Committee being advanced from £12 per ton, which operated throughout 1944, to £15 per ton at grower's sending station. The price for small fruit, used mainly for juice, was also similarly increased by £3 per ton to £10/10/- per ton. These advances, which were in line with joint recommendations from growers and canners were supported by a voluntary diversion scheme introduced by the Committee of Direction of Fruit Marketing, Queensland, a State authority with which fruitgrowers are closely allied. This arrangement had as its objective a more equitable division of fruit supplies between canneries and interstate fresh fruit markets. It is reported to have successfully operated, and its success is due in no small measure to the co-operation extended to the C.O.D. by growers.

The 1945 summer pack is recorded at 55,855 cases—somewhat disappointing in view of the efforts made.

The intermediate crop of Pineapples is reported to be heavy, and if followed by a good winter crop, the aggregate canned pack for 1945 should reach reasonable proportions.

Disposal of Stock.

The control over distribution of stocks of canned fruits, which has been exercised by Commonwealth Food Control in the recent war years, was again implemented in connection with the disposal of the 1945 pack.

The fullest co-operation was extended by canners in placing their stocks in approved directions.

Service and other Governmental demands (including substantial supplies for Allied Governments) were again heavy, absorbing approximately 70 per cent. of the total output. The balance was reserved for Australian civilian distribution.

A quota of 50,000 cases was provided for New Zealand. Supplies were also sent to U.K., India, Ceylon, Middle East, Netherlands East Indies and Pacific Islands.

The Australian domestic market quota of canned Apricots, Peaches and Pears, ex the 1945 packs, totalled 624,000 cases. This is lower by 68,000 cases than that provided in 1944.

The quantity of canned Pineapple released for civilian trade in 1944 was 24,670 cases, which of course would enable only token deliveries to be effected by distributors. From the 1945 summer pack 10,000 cases have been made

available for Australian civilian consumption. This figure will be built up by a release of stocks from the winter pack.

The 1946 processing season should open with no unsold stock held by canners.

Post-war Problems and Prospects.

In its 18th annual report, the Board made observations concerning the need for early classification of the befogged outlook on post-war trade in canned fruits.

Unfortunately, the position still remains obscure, except that consistent press reports confirm the view that the British preferential tariffs—determined at Ottawa in 1932—and which have proved of outstanding value to Australia, are being subjected to pressure for elimination or modification.

This is causing concern to fruitgrowers and canners. Representations have been made to the Government and an undertaking has been given that the Board will be fully consulted before existing arrangements are disturbed.

Approximately 60 per cent. of the pre-war production of Australian canned fruits was surplus to local market requirements, thus creating a considerable exportable surplus which at times caused embarrassment and financial loss in its disposal.

As the prospects for the successful disposal of this annual surplus are so uncertain, the Board stresses the opinion that it is inadvisable to embark on any sizeable expansion of areas devoted to canning fruits, including Pineapples until payable markets are found.

It is noted that soldier settlement schemes for fruitgrowing are under consideration, and it is desired to avoid the possibility of disappointment and financial distress.

Australia is capable of expanding its fruit production, but heed must be paid to economic considerations.

Personnel.

The personnel of the Board is as follows:—Sir Chas. Merrett, C.B.E., V.D. (chairman), Messrs. A. W. Fairley, T. L. Stafford, G. J. Evatt, B. Flewell-Smith, with Mr. W. J. Adams as Secretary.

Due to ill-health, Mr. W. B. Cooper, who was London Secretary for 18 years, retired on June 30, 1945. The loss of the services of this efficient officer was regretted. Unfortunately, Mr. Cooper did not recover from the illness and his death occurred early in July.

Statistics.

Details of the production and export of Australian canned fruits from 1926 to 1944 were published in the last annual.

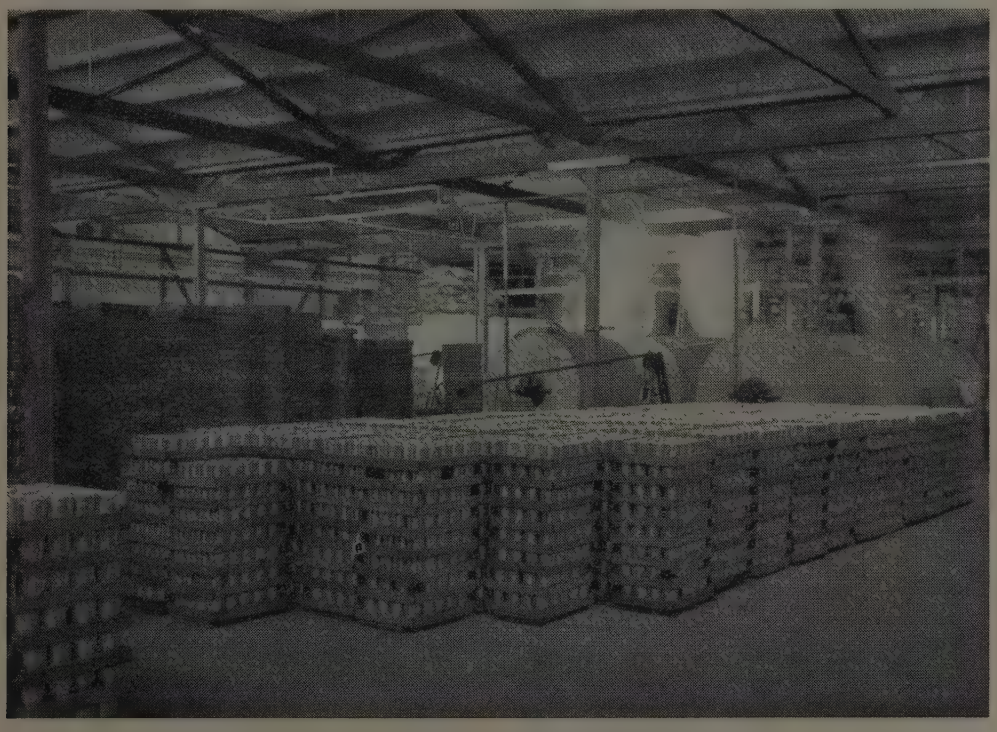
The figures for 1944 are repeated hereunder for comparative purposes with those for 1945.

Production of Canned Apricots, Peaches, Pears and Pineapples during the seasons 1944 and 1945.

(Figures in cases, each containing 2 doz. 30 oz. tins, or equivalent.)

Canned Apricots.

	1944.	1945.
New South Wales	83,936	10,495
Victoria	181,997	101,769
South Australia	51,682	20,967
West. Australia	—	971
Tasmania	10,331	4,429
Total	327,946	138,631



Interior view of a section of the Shepparton Cannery.

Canned Peaches.

	1944.	1945.
New South Wales	320,708	269,685
Victoria	†1,038,415	*1,030,094
South Australia	18,645	27,979
Total	1,377,768	1,327,758

Canned Pears.

	1944.	1945.
New South Wales	17,528	12,834
Victoria	500,568	532,694
South Australia	47,320	50,358
West. Australia	—	1,130
Tasmania	36,784	17,550
Total	602,200	614,566

Canned Pineapples.

	1944.	1945.
Queensland	110,798	‡55,855

Totals all Packs.

Canned	1944.	1945.
Apricots	327,946	138,631
Peaches	1,377,768	1,327,758
Pears	602,200	614,566
Pineapples	110,798	55,855
Total	2,418,712	2,136,810

†Includes 33,520 cases composite pack.
*Includes 35,088 cases composite pack.
‡Summer pack only.

CANNED FRUIT AND JAM MANUFACTURERS IN AUSTRALIA.

New South Wales:

J. Ambrose Ltd., Princes Highway, Kogarah.
Cottees Passiona Ltd., Marion-street, Leichhardt.
L. Cowing, 554 Parramatta-road, Petersham.
Fowlers Vacola Manufacturing Co. Ltd., Rosebery.
Good Food Products, 40 York-street, Sydney.
Holbrooks (A/asia) Pty. Ltd., Danks-street, Waterloo.
Hygienic Jam Co. Pty. Ltd., 23 Ivy-street, Darlington.
Illawarra Jam Co., 7a Norton-street, Leichhardt.
W. H. Johnson & Co. Ltd., Bruce-street, Waterloo.
H. Jones & Co. (Sydney) Pty. Ltd., Darlington, Sydney.
Lackersteen & Co. Pty. Ltd., 2 Parramatta-road, Camperdown.
Meadowsweet Jam Co., 11 May-street, Eastwood.
P. Methven & Sons, Mt. Druitt.
Leeton Co-operative Cannery Ltd., Leeton.
N.S.W. Jam Coy., Hay-street, Leichhardt, Sydney.
Pick-Me-Up Condiment Co. Ltd., Alice-street, Newtown.
Rosella Preserving and Manfg. Co. Ltd., Morley-avenue, Rosebery.
Sherwood's Jams & Preserves, 6a Isabella-street, Balmain.

Victoria:

Ardmona Fruit Products Co-op. Co. Ltd., Mooroopna.
Australasian Jam Co. Pty. Ltd., 1 Garden-street, South Yarra.
Bendigo Preserving Co. Ltd., Garsed-street, Bendigo.
Brookes Lemos Ltd., 69-79 Whiteman-street, South Melbourne.
D. Camm & Sons Pty. Ltd., Moonbulk.
Clegg & Kemp Pty. Ltd., 115 Stanley-street, West Melbourne.
C. Ellen, Birkenhead-street, North Fitzroy.
Fowler's Vacola Pty. Ltd., 253-259 Burwood-road, Hawthorn.
W. H. Johnson Jams Pty. Ltd., 42 Meaden-street, South Melbourne.
Kyabram Co-op. Fruit Preserving Co., Kyabram.
H. M. Leggo & Co. Ltd., Victoria-crescent, Abbotsford.
Francis Longmore & Co. Ltd., 617 Spencer-street, Melbourne.
R. Lohn & Co. Pty. Ltd., 36 Albermarle-street, Kensington.
Melbourne Jam Co. Pty. Ltd., 242 Rae-street, North Fitzroy.
Mildura Co-operative Fruit Co. Ltd., Box 104, Mildura.
Model Preserving Coy., c/r Campbell and Perry streets, Collingwood, N.5.
Rosella Preserving & Manfg. Co. Ltd., Cremorne Gardens, Richmond.
Shepparton Fruit Preserving Co. Ltd., Shepparton.
Henry Williams & Sons Pty. Ltd., Heidelberg-road, Alphington.

Queensland.

F. G. Butt & Sons, Murphy-road, Zillmere.
John Fischle & Sons Pty. Ltd., Bald Hill, Queensland.
R. M. Gow & Co. Pty. Ltd., Turbot-street, Brisbane.
J. Hargreaves & Sons Pty. Ltd., Manly, Queensland.
Queensland Canneries Pty. Ltd., Brisbane.
Summerland Preserving Co., May-street, Milton.
Sumner's Preserving Co., Flower-street, Nundah.
Tassell Products, Montague-road, Hill End, South Brisbane.
Victoria Cross Manfg. Co. Pty. Ltd., Woollongabba.

South Australia:

J. Brooker & Sons, Port-road, Croydon.
Glen Ellen Cannery, Hahndorf.
H. Jones & Co. (Adelaide) Pty. Ltd., Keswick.
Geo. McEwin & Son Ltd., 27 Grenfell-street, Adelaide.
Robson, Jarvis & Co., Hectorville, Montacute-road.
Rosella Preserving & Manfg. Co. Ltd., Kent Town.
Munzone Products Ltd., Payneham-road, St. Peters.

Western Australia:

Crystal Jam Co. Ltd., Railway-parade, East Cannington.
George A. McKim (Orchard Peel Co.), Edward-street, Gosnells.
H. Rayner & Sons, 90 Railway-parade, West Perth.

Tasmania:

H. Jones & Co. Pty. Ltd., Old Wharf, Hobart.
Tasmanian Rosella Preserving Co. Ltd., Hobart.
J. G. Turner Pty. Ltd., Morrison-street, Hobart.
Port Huon Fruitgrowers' Co-op. Association Ltd., Davey-street, Hobart.

Canning an Indispensable Industry

(By R. M. Moran.)

IN THE STONE AGE, warriors might wrest their sustenance from nature, but nowadays, we see the wisdom in economy of effort. As soon as war requires the concentration of men into a more dense population than the produce of the adjacent country will support, in the light of modern knowledge, the canning of foodstuffs becomes an indispensable industry.

In times past the menu of the fighting forces was the subject of a certain amount of local apprehension and in general of much comment and ridicule, but during World War II., the civilian population of many countries involved was not by any means as well provisioned as their fighting services. The lessons learnt in the past have brought about a realization that the health of the forces is of paramount importance and, whether they are confined in the restricted quarters of a warship, probe the tropical jungle or traverse the face of the desert, their efficiency is commensurate with their health. The better the victualling, the greater the striking force.

The problem of sending forward foodstuffs in a form which will provide against deterioration has brought about a remarkable development of the canning industry. Every imaginable type of food is now sealed in airtight cans. The quantity shipped from Australia to all parts of the globe runs into many millions and canned fruit and vegetables make up one of the biggest sections of these foods.

Vitamins.

Fruit is essential to health in respect to its nutritive values at any time; the availability out of season of canned fruits enables the provision of vitamins in a delightfully appetising form when otherwise they would be unobtainable.

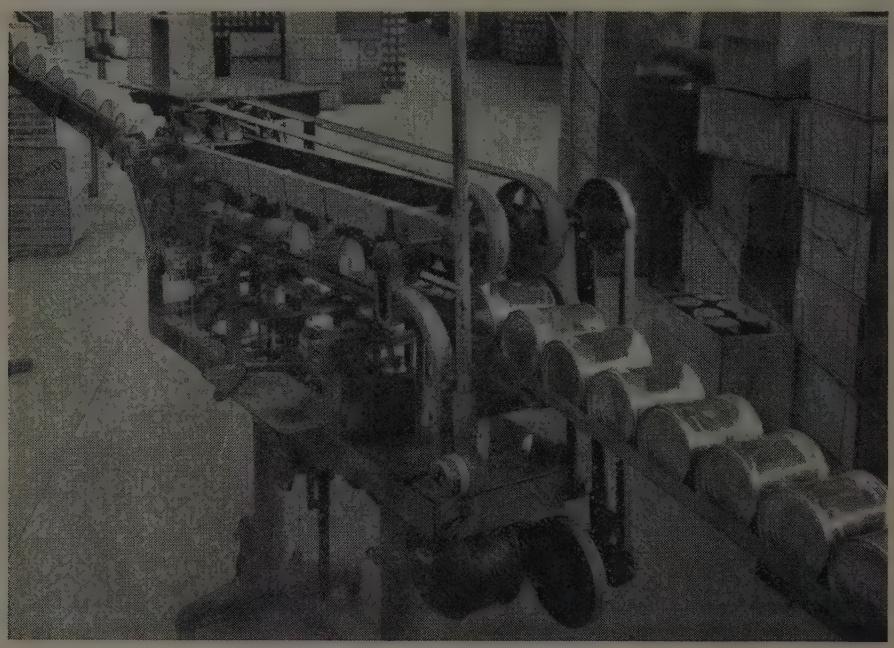
Timing Harvesting Insures Quality.

Fruit to have its full complement of the various vitamins must be harvested at the correct period of its development. To be accepted, the fruit must be without blemish, must be a certain size and must have reached the correct stage of ripeness. Harvested and preserved within a few hours the natural flavour and juiciness of truly ripe fruit are retained.

Development of Canning.

Apart altogether from the exigencies of war, industrialization, which has been general in most countries in the past hundred years, has conditioned the populace to depend on all manner of conveniences and amenities, and has caused local sources of food and water to be no longer adequate. While water is brought from a distance and supplied constantly through pipes, there can be no correspondingly simple counterpart for the food supply. In course of transport, foods are liable to rapid spoilage and special precautions must be taken to preserve them.

The traditional methods of preserving by salting, smoking and pickling give fair protection against bacteria but change of flavour and appearance. Refrigeration definitely delays the activity of bacteria but does not afford a continuous protection from grower to consumer. Complete and lasting protection from all forms of deterioration is, however, afforded by enclosing food in strong, hygenic containers, impervious to air, light,



Labelling machine in a Cannery.

moisture and bacteria. By simply heating the cans thoroughly as soon as they are filled with the food all bacterial or chemical action is prevented and the contents remain in a fresh condition indefinitely.

A French Discovery.

"How can we feed our Armies? Can we preserve food that will be free from spoilage in transit?"—That was a problem exercising the people's mind to some purpose in the Napoleonic era at the dawn of the last century. In 1804 Nicholas Appert, a French confectioner, tried packing meat, fruit and vegetables in glass bottles and immersing them in boiling water. In England the heat method of preserving foodstuffs dates from 1808, when Thomas Saddington read a paper on the subject before the Royal Society of Arts. In that year the first patent was taken out in England by Peter Durand and it is of interest that in his specification first mention was made of a tin plate container. The use of the tin can, however, did not become popular until many years later.

The first seeds of the American canning industry subsequently were developed by William Underwood in 1817, where he commenced canning all kinds of foodstuffs at Boston soon after his arrival from England.

Sir Humphrey Davy discovered a method of increasing the boiling point of water under atmospheric pressure to 240 deg. F. by the addition of calcium chloride. The application in 1843 of this discovery, together with the American Civil War brought immediate prosperity to the industry.

In 1873, Mr. A. K. Skivers devised the prototype of the present retorts, the first piece of scientific equipment given to the industry and one which has remained practically unchanged to the present day.

In 1893, Dr. Russell of the University of Wisconsin, at the request of the Albert Sandreth Co., investigated the cause of the frequent explosions of Pea cans. "Complete sterilization," he found "by a single application of heat can always be successfully produced by a proper relation of time of exposure to temperature obtained." This report has since been summarised in the Thermal death time curves of the more heat resistant anaerotes, and has placed the industry on a basis of scientific fact.

Looking back over the annals of canning one observes that the warfare invariably increases the demand for suitable canned products and the market so gained is invariably held in the ensuing peace. The Napoleonic War started the demand, the American Civil War stimulated it, the Spanish-American War of 1898 multiplied it sixfold, the South African War may be called the progenitor of the industry in Australia. World War I. saw its world-wide expansion, and we are well aware of the insatiable and unprecedented demand on canned foods of World War II.

In Australia the fruit canning industry has made rapid strides and in almost every State large canneries preserve a very large tonnage of all varieties of fruit each season.

Success has followed the educational publicity efforts in Argentina to increase the consumption of fruit as an article of diet for health.

The importance of "conditioning" Pears prior to sale is attracting more and more attention. The delivery of Pears to the public in a condition fit to eat would largely increase sales.

Review of the Australian Trade

1945 Crops Lowest Since 1936

THE DISTRIBUTION of Australian Dried Fruits is regulated by Federal and State Legislation. Export matters are dealt with by the Commonwealth Dried Fruits Control Board. State Legislation has been enacted in the dried fruit producing States of Victoria, New South Wales, South Australia and Western Australia.

The 21st Annual Report of the Commonwealth Dried Fruits Control Board is an interesting document, providing statistics of production and distribution since 1925 and giving details of matters of policy.

In 1925 the Australian production of Sultanas, Currants and Lexias was 37,217 tons (i.e. long tons—2,240 lb.) This total steadily rose (after a light crop in 1926) to the all-time record in 1944 to 104,261 tons. This was made up of Sultanas, 68,251 tons; Currants, 25,332 tons and Lexias, 10,678 tons.

The 1945 crop of 68,000 tons is the lowest since 1936. The avarage production for the years 1942, 1943 and 1944 was 95,900 tons. The dust laden winds from the drought stricken areas, the shortage of fertilizers, late frosts in some areas, and the very high yields during the previous three years are the main causes assigned for this drastic fall in production. The fall from 104,261 tons in 1944 to 68,000 tons in 1945 represents a loss to the Australian Dried Fruits Industry of approximately A£2,000,000.

Allocation of Australian Crop.

The allocation made as a result of consulation between the Australian Government, the London Food Council and the Combined Food Board in the U.S.A. was 43,000 tons for export and 25,000 tons for Service and Civilian requirements in Australia. These quantities are greatly below the needs of the Australian and Oversea markets.

Because of the short crop in 1945, it has only been possible to make available 21,500 tons of Currants, Sultanas and Lexias to the United Kingdom. The Board also regrets that it was necessary to reduce the allocations to Canada and New Zealand this year.

Developing Overseas Markets

Exports.

Of the 1944 production 104,261 tons, there was retained in Australia a total of 35,615 tons. The following quantities were exported, to the United Kingdom, 44,570 tons; to Canada, 16,000 tons, and to New Zealand, 6,656 tons. Details of other production and distribution figures have been included in previous issues of the "Fruit World Annual."

The fruit shipped to the United Kingdom in 1945 (viz. 21,500 tons) was sold at the following prices f.o.b. in English Currency:—

Curants	£34	10	0	per ton
Sultanas	£45	5	0	per ton
Lexias	£44	15	0	per ton

These prices are £1/5/- per ton more than those received last year.

Production and Markets.

The Board is in full sympathy with the policy of the Commonwealth and State Governments to settle returned servicemen on the land. The success or otherwise of such a policy is dependant on the outlet for the disposal at profitable prices of the resultant products.

On the areas under vines in Australia sufficient Currants, Sultanas and Lexias can be produced to supply the demads in Australia, Canada and New Zealand, where the existing tariff protection enables the fruit to be sold at a reasonable profit on the cost of production.

In respect of the U.K., we have available an average annual surplus of approximately 45,000 tons per annum which with the supplies sent from Greece, Turkey, South Africa and U.S.A. is sufficient to meet the requirements of that market.

To retain these markets for the fruit now produced in Australia, it is essential that the existing tariff preference be continued or replaced by a system of international control of the production and distribution of Dried Fruit which will enable the export surplus from

existing areas in Australia to be sold in oversea countries at payable prices.

With regard to the opening up of new areas in the Commonwealth for the increased production of Dried Vine Fruits, the position as set out in paragraphs 399 and 400 of the Third Report of the Rural Reconstruction Commission is that the attempt to aim at this increased production without a reasonable expectation that the Australian domestic market coupled with the International demand will be able to absorb the additional production at a payable price, is courting financial disaster.

It is significant that a warning has been issued in California against increased planting of vines for Raisins in the United States. In a report dated February, 1945, Messrs. H. E. Jacob and A. J. Winkler of the University of California state:—

"High Grape prices from 1942 to 1944 have stimulated an interest in new Grape plantings for Raisins unequalled since the planting spree of the early 1920's. Ruinously low prices followed that former expansion. Unwarranted expansion of the vineyard acreage now will certainly bring on a similar disaster in the readjustment period following World War II."

The Board would strongly urge that the Australian States concerned in any expansion of the Dried Vine Fruits Industry work in unison with each other and the Commowealth and that no such expansion be carried out unless after an economic survey by the Commonwealth Bureau of Agric. Economics it is considered possible to find payable markets for the increased production.

International Food and Agricultural Organization.

The constitution of the International Food and Agriculture Organization (known at F.A.O.) prepared by the Interim Commission appointed at the United Nations Conference on Food and Agriculture held at Hot Springs, Virginia, U.S.A., in June, 1943, has been adopted by Great Britain, the Commonwealth, the United States and a further thirty of the forty-four Nations represented at the Conference.

Advice has been received that the inaugural Conference of the Organization is likely to be held at an early date. The objectives of F.A.O. are **to raise the level of nutrition and the standard of living of all peoples, secure improvements in the efficiency of the production and distribution of the world's food and agricultural products, and better the conditions of all rural people, thus contributing to an expanding world economy.**

The Conference is expected to appoint a Director-General of the Organization and decide what are to be the first tasks of the F.A.O. in the fields of agricultural production and marketing and food management, fisheries, forestry and primary forest products and statistics.

After the Conference has been held, the F.A.O. will begin work immediately with a small nucleus staff.

The Chairman of the London Agency of the Commonwealth Dried Fruits Board (Mr. F. L. McDougall, C.M.G.) is closely associated with the F.A.O.

The Board is deeply interested in the objectives and will be pleased to furnish any information that is desired and which may be available relating to the Australian Dried Fruits Industry, and to co-operate in any international schemes that may be proposed for the improvement of the production and marketing of Dried Fruits.

Research Work.

(a) In Australia.—The following investigations were carried out on behalf of the Board by the Council for Scientific and Industrial Research at its Merbein Station in Victoria during the twelve months ended 30th June, 1945:—

(i) Effects of the Drought Conditions.—The drought conditions, and the resultant crop losses were matters of major interest to the dried fruit industry, and the investigations of the effects of drought, hot winds, and dust was a major project in the work of the station. The normal behaviour of the vines is now so well known that departures from normal were readily recognized, and the effects on the current years crop was anticipated. The effects on the fruiting wood were also examined. The interest of producers in this work is illustrated by the fact that over 1,000 vine-growers assembled at various centres in early June of this year to hear the results of the investigations; and to discuss the pruning modifications necessary to meet the changed circumstances.

(ii) Fruit Processing.—Fruit processing is still largely affected by cessation or shortage of supplies due to the war; and it has been possible to use satisfactory alternatives, including substitute substances and reduced concentrations. Investigations include studies of the effectiveness of the substances used in the dips and fundametal studies in reference to the functions of oil in the dipping process.

(iii) Light Brown Apple Moth.—The Light Brown Apple Moth (Tortrix postvittana) was further investigated, in co-operation with the Division of Economic Entomology; but this pest, which caused widespread damage in the previous year was not in evidence. The disappearance of the pest synchronized with the hot winds of October. It is considered that the conditions which were too severe for the vines were also too severe for the larvæ, though the possibility of control by natural enemies noted in the vineyard has been recorded.

(b) In the United Kingdom. — The Biological Field Station at Slough, England, under the direction of Professor J. W. Munro and assisted by Dr. Page and Dr. Lubatti has continued to carry out investigations on behalf of the Board in regard to the treatment of dried fruits to prevent their deterioration on arrival in the United Kingdom.

Finance.

The rates of Levy imposed under the dried Fruits Export Charges Act 1924-1929 on dried fruits exported during the 1945 season were as follows:—

Currants .. .. .. 1½d per cwt. or 2/6 per ton.
Sultanas .. .. .. 2d. per cwt. or 3/4 per ton.
Lexias .. .. 2d. per cwt. or 3/4 per ton.

The income for the year ended 30th June, 1945 amounted to £29,561/6/7.

Publicity.

It will be noted that the Board during the year ended 30th June, 1945, spent £4,772/1/2 on special publicity in the United Kingdom. This publicity which is being continued during the present financial year, takes the form of a grant in respect to Sultanas packed in 1 lb. cartons and included in parcels with other Australian produce which are purchased at a special price by the Victoria League on behalf of the Incorporated Soldiers'

Sailors and Airmen's Help Society, London, and are distributed to the relatives and friends in the United Kingdom of Imperial Servicemen who are engaged in widely scattered areas.

The Board's accumulated funds will be devoted principally to publicity which must be undertaken in the near future for the purpose of retaining and if possible increasing the existing demand for Australian dried fruits in oversea markets.

Personnel of the Board.

Members nominated by the Government of the Commonwealth:—

Messrs. R. H. Gilbert (Chairman), J. B. Murdoch, E. J. Mulvany, I.S.O..

Members elected by the Producers of Dried Fruits:—

Messrs. H. D. Howie, O.B.E., Sth. Aust.; P. Malloch, Vic.; E. J. Casey, Vic.; H. V. Foster, W. Aust.; L. B. O'Donnell, N.S.W.

To fill the vacancy caused by the death of Mr. L. McLeod, Mr. O'Donnell was elected a Member of the Board by the Growers of N.S.W. for two years from the 7th February, 1945.

London Agency.

The Agency of the Board in London comprises:—Messrs. F. L. McDougall, C.M.G., Chairman; A. E. Gough, O.B.E., Member; J. J. S. Scouler, Executive Member and Secretary.

Officers of the Board.

The officers of the Board at Melbourne and London are as follows:—

Melbourne.—Secretary: Mr. R. A. Marx; Economic Advisor, Mr. E. J. Mulvany, I.S.O.

London.—Secretary: Mr. J. J. S. Scouler.

Death of Mr. Walter P. Caro.

The Board records with deep regret the death on the 12th June, 1945 of Mr. Walter P. Caro, who had filled the responsible position of Chief Appraiser on the staff of the London Agency of the Board since its establishment in 1925. The Board further records its appreciation of the long and faithful service rendered to the Australian Dried Fruits Industry by Mr. Caro.

Visit Overseas of Chairman.

Mr. R. H. Gilbert, Chairman of the Board, is visiting the U.S.A., Canada, and the United Kingdom. He has already discussed with representatives of the United States' dried fruits industry questions of common interest in relation to the production and distribution of dried vine fruits.

In the United Kingdom he will confer with the members and staff of the Board's London Agency on various matters of administration. During his visit abroad, Mr. Gilbert will obtain as much information as possble regarding the best methods to be followed to retain, and if possible increase the existing demand for Australian dried fruits in Canada, the United Kingdom and other oversea countries.

During Mr. Gilbert's absence, Mr. H. D. Howie was Acting Chairman of the Board.

THE PRODUCTION IN EACH STATE OF THE SEVERAL CLASSES OF DRIED FRUITS FOR THE SEASONS 1931 TO 1945.

Currants.

	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Vic. . .	7,772	7,143	7,604	7,309	8,658	3,870	7,251	8,607	9,968	9,874	6,708	8,579	8,606	9,967	6,850
S.A. . .	7,435	8,084	6,617	8,415	9,248	5,701	7,965	9,046	9,601	10,437	6,732	8,804	9,254	10,504	6,846
N.S.W..	573	572	696	879	1,008	689	1,001	1,068	1,282	1,509	1,016	1,380	1,298	1,527	979
W.A. . .	1,700	1,469	1,552	1,293	2,104	2,076	1,971	2,013	3,256	2,978	2,467	2,421	2,058	3,334	2,865
Total .	17,480	17,268	16,469	17,896	21,018	12,236	18,188	20,734	24,107	24,798	16,923	21,184	21,216	25,332	17,540

Sultanas.

Vic. . .	17,938	24,805	37,922	29,656	25,609	30,258	31,778	42,870	27,212	41,985	34,513	42,183	40,454	43,526	27,756
S.A. . .	5,779	8,553	10,814	10,040	11,023	8,615	9,053	13,497	9,699	12,209	10,956	12,423	11,373	16,660	9,297
N.S.W..	2,454	2,985	4,635	4,436	3,143	4,242	5,041	5,805	4,114	7,411	6,256	7,488	7,270	7,431	4,340
W.A. . .	224	363	445	327	446	465	370	453	358	430	306	343	404	634	337
Total .	26,395	36,706	53,816	44,459	40,221	43,580	46,242	62,625	41,383	62,035	52,031	62,437	59,501	68,251	41,730

Lexias.

Vic. . .	3,996	2,671	4,403	3,823	3,535	4,499	4,105	5,163	4,551	5,126	5,561	4,877	5,550	5,871	5,091
S.A. . .	2,156	1,237	2,645	2,859	1,640	1,879	2,042	2,552	2,079	2,850	4,531	3,436	3,898	4,076	2,988
N.S.W..	214	180	272	303	304	367	358	383	395	501	524	531	600	662	603
W.A. . .	308	439	227	251	186	281	284	230	411	262	163	97	113	69	48
Total .	6,674	4,527	7,547	7,236	5,665	7,026	6,789	8,328	7,436	8,739	10,779	8,941	10,161	10,678	8,730

All Grades

Vic. . .	29,706	34,619	49,929	40,788	37,802	38,627	43,134	56,640	41,731	56,985	46,782	55,639	54,610	59,364	39,697
S.A. . .	15,370	17,874	20,076	21,314	21,911	16,195	19,060	25,095	21,379	25,496	22,219	24,663	24,525	31,240	19,131
N.S.W..	3,241	3,737	5,603	5,618	4,455	5,298	6,400	7,256	5,791	9,421	7,796	9,399	9,168	9,620	5,922
W.A. . .	2,232	2,271	2,224	1,871	2,736	2,822	2,625	2,696	4,025	3,670	2,936	2,861	2,575	4,037	3,250
Total .	50,549	58,501	77,832	69,591	66,904	62,942	71,219	91,687	72,926	95,572	79,733	92,562	90,878	104,261	68,000

Empire Preference in the Melting Pot

Red Light to Fruit Industry

By The Hon. J. McEWEN, M.H.R., Deputy Leader of the Australian Country Party.

THE SYSTEM of Empire Reciprocal Preference has, as is well known, been on the table for discussion in the negotiations between the United Kingdom and the U.S.A. Governments in connection with the recent loan to the United Kingdom.

What commitments in this connection the United Kingdam entered into have not been revealed other than that it has been said that it was agreed to have a general review of tariffs.

Considering that the matter was of such transcending importance to Australian national economics and was capable of immediately affecting the livelihood of many thousands of Australians, the Commonwealth Government has been peculiarly silent.

I am afraid there is not sufficient realisation of the great extent to which the economics of most of the Australian export industries have been built up on the system of Empire preferences.

Wheat and wool alone of all the land industries are not dependent upon Empire preferences, and the advantage of Empire preferences does not arise merely from the higher price secured in the United Kingdom market.

Whenever there is an export surplus, the higher export parity value which comes from the preference system also becomes the determining factor in the home consumption price level in certain industries, notably in the meat industry. which has no separate arrangement for home consumption price fixation.

When I was in America recently, I found widespread evidence, both in commercial circles and Government administrative circles, of a belief that the Ottawa Agreement represented a "ganging-up" by the units of the British Commonwealth to exclude Americans from their markets, and a clearly evident intention to endeavour to break or reduce the system of Empire reciprocity.

The extraordinarily high American tariff which on so many items operates as a complete embargo against sale of Empire products into the U.S.A., was conveniently overlooked.

A substantial and general breaking down of Empire preferences would appear to me to affect various of our industries in varying degrees.

I cannot imagine an agreement in which there was a commitment to reduce United Kingdom tariffs favouring Empire products which did not obligate the United States to a concurrent reduction of certain of that country's tariffs.

On this hypothesis, wool would lose nothing, for there is no Empire preference, but might gain great advantage by admission to the United States.

Wheat, on which there is so little Empire preference as to be of scarcely any account, would be unaffected except that a widening of the area of tariff reduction which might reasonably be expected to follow this bi-lateral agreement, may open new markets for our wheat in Europe.

Meat would suffer greater competition from South and North American competitors, and at a later date in respect to pig meat from European competitors.

On the other hand, in view of the existing quite severe meat shortage in America, there might easily be founded an export trade to that country. This obviously, could not commence whilst the United Kingdom was so short of meat, and the opportunity for it might disappear after a few years as American livestock population fills up.

Dairy produce would encounter European competition in the United Kingdom market as soon as European dairy herds can be increased.

On the other hand, the United States is exceptionally short of all dairy products other than fresh milk, and there is unquestionably opportunity for developing a big sale to that country of the products of this industry following any arrangements for all-round tariff reductions.

It appears to me that, in such circumstances, there would also be an opportunity for **export of fresh fruit to America**, especially as our production becomes available in their off season.

The one industry for which I can only see disadvantage, with no compensating advantage of the possibility of American trade, would be the canned fruit industry.

Here we have a position where reduction in Empire preferences would lay us open at the least to American competition in the United Kingdom, and possibly to American dumping, as that country's export surplus of canned fruits is of very important magnitude by comparison with our export surplus, but still is a relatively small proportion of the total American pack.

This seems to confront Australian canning fruit growers with a really serious threat, and in this case, of course, there is no compensation of any possible sale in America.

Our dried fruits could be seriously affected if, under a wider arrangement of tariff reduction, they were allowed open to the competition in the United Kingdom of dried fruits from the Mediterranean area.

Because at the date I write, there has been no detailed explanation of the United Kingdom's commitments and no statement whatever by the Commonwealth Government either on its commitments or policy, one can at this stage only examine possible implications of the Agreement.

This examination is sufficient to show that the whole matter is of tremendous consequence to Australia and that the fruit industry is especially liable to be affected.

GREETINGS . . . *from the*

N.S.W. Chamber of Fruit and Vegetable Industries

J. J. MASON,
Deputy President.

H. P. WOODWARD, M.L.A.,
President.

P. S. MACDERMOTT,
General Secretary.

GOODWILL

On behalf of the N.S.W. Chamber of Fruit and Vegetable Industries, it is again my privilege to extend Seasonal Greetings to all readers of the "Fruit World Annual."

This affords me additional pleasure in so far as the past year has seen the successful conclusion of world hostilities, and which has resulted in fresh honours to the British Commonwealth of Nations and her Allies.

I would also take this opportunity to congratulate the Fruit and Vegetable growers on the splendid part they played in the war effort.

MESSAGE

Difficult post-war problems now confront our Industries and these call for united effort on the part of all concerned.

It is the desire of the Chamber to bring about a greater spirit of co-operation between all Sections of the Industry, and in that connection, it pledges its utmost endeavour to assist all branches of our Industries. All have suffered owing to manpower difficulties and various controls inseparable with war conditions, and it will need the concerted effort of all connected with the Industries to bring about a speedy restoration to normal peace-time conditions.

H. P. WOODWARD,
President.

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Offices: 215a Thomas Street, Haymarket **Telephone: MA 5050**

World Trends in the Apple Industry

Methods for Increasing Consumption

AS THE APPLE is the major fruit grown in the world it is of interest to observe world trends in Apple production and marketing.

The International Apple Association with headquarters at Rochester, N.Y., U.S.A., is an important organisation. In the last Fruit World Annual a report was published from the pen of the Secretary, Mr. Samuel Fraser. Continuing the theme Mr. Fraser has an interesting article in the 1945 Reference Book of the International Apple Association. He writes:—

"We would like to aid in the displacement of anarchy in international economic and trade relations by world order and the rule of law. This necessitates common consent. Looking backwards, we see how nations have sought their immediate interests, forgetting that the short term advantages for themselves sooner or later injured their neighbours and finally themselves. This policy invites economic war and in the long run has led to world war.

World Business.—World trade and prosperity are indivisible. The issue that is now hanging in the balance and which we are being called on to consider is the avoidance of future wars, the establishment of understanding between nations, the recognition of policies in our dealings with one another which will lead to happiness among mankind and so assure us that peace, which is essential if we would restore world trade and prosperity. There is a place for the protection of one's self. There is a short-sighted selfishness, lack of understanding of economic truths, that we may, if not rightly led, lose the peace as we did in 1919.

" . . . We must seek to establish the greatest measure of common growth on which all can work for the common good. This will involve recognition of the different systems of trade which are found in different countries and among different groups. We expect that the Russian economy will still be based on a full State trade system. We expect that the United States will follow the policies which have been established for the last 300 years of individual trade and the fullest opportunity for the individual to exercise all of his ability to the fullest."

. . . After recognising the use of Government for certain problems of society, Mr. Fraser urges the removal of many of the trade barriers and believes that a lead in this direction by the British Commonwealth of Nations and the United States will be a very valuable contribution to better world understanding.

He recognises that Great Britain recently voted for State ownership of Bank of England, nationalisation of coal, iron and steel industries, transportation, housing and building, export and imports, protection for agriculture, the Government entering into the direction of business affairs in many lines of industry.

He believes, however, that there will be official caution and moderation. However, the new trends will have a bearing on American policy. Summed up the position appears to be—

Russia's system is entrenched and may spread.

The U.S.A. is the major exponent of the private enterprise system.

Great Britain is now entering into an experiment with a mixed economic system, part Government, part Government-owned and operated. and part private.

World Trade.—The decisions of the Hot Springs Conference (Virginia) are approved in general—to organise world production of farm crops, to endeavour to even out abnormal fluctuations in production, to standardise products, to curtail transport costs, to foster research.

However, Mr. Fraser doubts if people are yet ready for acceptance of the idea of the world as the unit—the listing of supplies and all the world markets and then the planning what each shall produce and in what amounts . . and continues: "We believe that individual enterprise should be maintained. We are not in agreement with many who believe that the only and proper safeguard is blueprinting production for the benefit of the producers."

Food and Health.—The Hot Springs Conference approved the study of the world food policy based on human needs. It proposed the adoption by the various countries of the policy based on health standards and that this policy should be on a world scale.

As the income for a family falls, the average diet tends to become restricted; certain diets indicate deficiencies in vitamins, minerals and proteins.

Dietitians emphasise that as the diet has less protective foods—milk, dairy products, eggs, fruit, vegetables and meat—health tends to decline.

Our interest then lies in the development of the utilisation of the protective fruits and vegetables.

We need to emphasise the value of publicity and the extension of dieting knowledge.

Mr. Fraser then quotes authoritative statistics showing disease and death rate due to malnutrition, with India as the lowest in the world relative to prospective life (prospective life there, 26.9 years, as compared with New Zealand, the highest with a prospective life span of 65.6 years) and continues:—

"From the evidence before us it is potent that we cannot afford to overlook the fact that fruits and vegetables are closely associated with health."

He concludes on a high note regarding the requirements of democracy, based on character and integrity . . . "If civilisation and citizenship are to be saved we must deal honestly and righteously with each other and with the nations of the world."

SOME PRACTICAL SUGGESTIONS

Vending Machines for Pure Fruit Drinks—Consumer Packages—Market Research.

Another article in the Reference Book above referred to is from Mr. Noel Bakhe, Vice-President in charge of the Sales of one of the large Distributing Concerns. He quotes a leading authority on the subject of vending machines thus—

"**Vending Machines** have increased tremendously to distribution of cigarettes, gum, cocoa-cola, and many other commodities—now one has been invented that will deliver a glassful of freshly crushed, cold orange juice for a dime (say 5d.); **7,500 of these refrigerated vending machines have been ordered for the Chicago area alone**—that number will move a lot of Oranges.

Consumers' Packages.—A grower in Massachusetts said that when he could get cartons and packing materials, he packed and despatched 150 carloads (around 100,000 bushels) of Apples in 2 lb. cartons to New York City. He said:

"It took me 10 years to develop this carton which is adapted to the use of our size Apple, 216 and larger. At first I experimented with larger cartons, but I found that the 2 lb. size is ideal in every respect. I am confident that this type of carton will increase the consumption of Apples and will find enthusiastic acceptance from the retail trade. Cost of putting up Apples in these cartons is little more than packing in ordinary boxes."

Other produce is being despatched in consumer packages —asparagus in 1 lb. bunches, wrapped in cellophane, packed in 30 bunches in a regular container—lettuce individually wrapped in cellophane, packed in regular 1½ crates—as well as peas, fresh shelled, packed in 8 oz. cellophane bags.

What place should consumer packages and vending machines have in the marketing of Apples? This question should be answered.

Advertising, Merchandising and Research — and the greatest of these is Research—because it is the foundation on which are built enduring programmes of advertising, merchandising and marketing.

Research is needed to measure results. It is a foundation essential in building merchandising and advertising, especially adapted to the particular commodity. Research should reveal facts about consumer packages, cartons, vending machines and many other problems.

The Apple industry should find out how to deliver crisp, cold and juicy apples to the consumer—this done might well double the demand for Apples.

The pioneering spirit is needed more to-day than ever. It will take plenty of imagination and resourcefulness, daring and skill as well as industrial co-operation to meet the problem of adjusting to the post-war world.

Mr. S. Cooke, President of a leading Distributing firm in Philadelphia, writes:—

"**Consumer Packages** for fruit and vegetables are definitely on the horizon; they only await the development of proper units as to cost and adaptability. The retailer is eager for them. The packaging of these commodities may be at production point, at a centralised warehouse at the wholesale level, or at the retail store.

They will vary with different commodities, depending on whatever factors of perishability designates the point to which the consumer package ought to be created.

Refrigeration is a **must** with the wholesaler, as well as with the retailer, to keep commodities at proper temperatures so that consumers will not have products broken down in quality.

Also, there are under development cartons to preserve freshness which will soon be employed by the retailer. For example, Apples and Pears require refrigeration to the point of sale, whether wholesale or retail, to give the consumer good condition and quality.

As to Pears, information to instruct the retailer and wholesaler in scientific ripening should be made available.

A small printed sheet in each wholesale package, giving specific instructions as to how the item should be handled, would serve a good purpose.

J. W. BRYANT

The firm of J. W. Bryant, City Markets, Sydney, is an old established business, which in 1919 was taken over by Mr. Gordon Milne, who continued to trade under the old name. During 1945 Mr. Milne took his two sons into the firm, and they are now actively associated in its administration.

The firm does not specialise in any particular line, but it is prepared to accept from orchardists all kinds of citrus and pome and stone fruits.

Consumer Packages

SUCCESS WITH POTATOES, ONIONS, ORANGES AND APPLES.

Experiences in U.S.A.

THE success of the consumer-size bags of Potatoes, Onions and Oranges logically led to the development of the consumer-size Apple bag in U.S.A. This movement started in the early 1930's. The first efforts in this direction were encouraging and in 1932 possibly 10,000 or 15,000 Apple bags were used. Interest, however, developed rapidly and in 1933 upwards of 100,000 bags were used. Since that year, the use of bags has increased steadily and it may be roughly estimated that **a million and a half bags** of Apples have been packed in a year.

The 5 lb. woven paper fabric bag has been the preferred size and type. Bags of contrasting and complementary colors have been tried but for red Apples a deep, rich purple open-mesh bag has been found to be the most attractive and satisfactory. It makes a colorful package that has eye-appeal.

Transcontinental shipments have been made with practically no damage. The longest shipment on record was made from Yakima, Washington, to Portland, Maine—right across the Continent. The arrival condition of the

Woven paper fabric bag as described in this article.

Apples was completely satisfactory. Other shipments have not proven so satisfactory, which means the method is not fool-proof.

The usual method of shipping is to pad the floor and side walls of the refrigerator car with excelsior or straw and cover it with heavy paper. These precautions and careful loading are needed to assure safe arrival of the fruit.

Retailer reports advise that apples in bags show less damage than Apples in boxes. When Apples are packed in boxes the lids are forced down in nailing and the Apples on the top layer are likely to be bruised.

Certain Apple shippers have built up a demand in the trade for their brands. However, the consumer as a rule is not brand-conscious as far as Apples are concerned. With consumer-size Apple bags it is possible to carry the brand to the user of the Apples. The open-mesh bag has a white horizontal band running across the centre, both front and back, on which a brand can be printed in multi-colours. Shippers are thus able to build up a demand with consumers for their Apples.

The 5 lb. Apple bag has been in big demand by the retail trade. Storekeepers have learned the following facts regarding consumer units:—

1. They are easy to handle.
2. They make attractive, colourful mass displays.
3. They save time in waiting on customers (fewer clerks needed).
4. They save store bags.
5. They eliminate bottlenecks in the Produce Department.
6. They increase the unit of sale per customer.
7. They eliminate "picking-over" of fruit on the produce stand.
8. They speed up work at check-out counters.

With the increased growth of self-service stores, consumer units—especially of fresh fruits and vegetables—are becoming more and more important.

Opinions from well-known members of the trade are as follows:—

The fruit must be freshly packed and none but the hardest stock must be used. Careful handling is essential throughout. They are easily ruined by careless unloading and handling in the stores.

The fruit must be packed fresh as the orders are received through the Winter and early Spring: this practice ensures against loss from decay and shrinkage . . . The consumer package will increase consumption of Apples but it is necessary for the industry to improve both packing facilities and its equipment. This means lug boxes for holding the fruit in storage and properly equipped packing plants, in order to be successful.

—International Apple Association Annual.

The firm of T. Stott & Sons Pty. Ltd., which conducts business at 26 and 36 Wholesale Fruit Market, Melbourne, Vic., with Vegetable Department in the Victoria Market, is one of the best known Wholesale Fruit and Vegetable Merchants in Victoria, having been established over 60 years ago. The Company receives consignments of Fruit and Vegetables from growers in all Australian States, as well as conducting one of the largest country order businesses in Victoria. Personal attention by the principals has built up a large and constantly increasing circle of satisfied clients.

Packham's Triumph Pears grown in Argentina are stated to be superior to the same Pears grown in the country of origin—Australia.

The Fruit Industry of Argentina

APPLES — PEARS — GRAPES — CITRUS — STONE FRUITS.

EXPORTS OF FRESH CANNED AND DRIED FRUITS.

The story of the rise of the Argentine fruit industry from insignificance to one of international importance is of profound interest to Australia, New Zealand, U.S.A., and other parts of the world.

Are we living, as Wendell Willkie said, in "one world," and will it be possible for nations to plan their national and international policies to avoid trade wars and other wars, too?

The following article is a summary of the book entitled "The Fruit Industry of Argentina," by Fred. A. Motz, Fruit Specialist, U.S.A. Office of Foreign Relations. It was written during the war just ended. The statistics and general information will be read with keen interest by all observers of world trends in the fruit industry.

COMMERCIAL FRUITGROWING in Argentina is a comparatively recent development, in fact it is associated with railway development. From 1900 to 1930, railway mileage increased from about 10,000 to 25,000 miles.

Since Governmental authorities originally took little interest in developing new regions, it largely fell to the railroad companies to do the pioneering work. They established nurseries and experimental stations, engaged scientists for research work and commenced large-scale operations.

Because of its wide range of latitude, Argentina is capable of growing all kinds of fruits.

From 1922 to 1926, orchards were established on a commercial basis, but it was not until 1932 or 1933 that shipments began to reach significant proportions.

In 1937 Argentina produced a total of 1,815,000 short tons of fruit, including Grapes. Since then production has increased considerably.

In 1935 a surplus in certain fruits began to develop. From 1937 to 1939 Pear loadings increased from 2,029,000 boxes to 3,264,000 boxes, while Apples increased from 1,817,000 boxes to 2,342,000 during the same period. There were similar increases for all kinds of fruits.

With a total of 26,919,000 bearing trees in 1937, producing 375,000 short tons of fruit, it is reasonable to assume that a total of 47,938,000 trees in a few years' time will be capable of producing around 660,000 tons.

Production of Marketing of Deciduous Fruits.

The progress made in the production of tree fruits in Argentina during the past decade is **one of the outstanding features of the world fruit picture.** Within ten years the country changed from a net importer of fruits to a net exporter.

Argentine fruit was virtually unknown on world markets prior to 1935.

Before World War No. 2 dislocated the trade, however, Argentine fruit, especially Apples, Pears, and Grapes, were firmly established on European and American markets.

As late as 1931 Argentina was importing about 750,000 bushels of Apples annually from U.S.A. This was progressively reduced to 50,000 boxes in 1940. In 1933 Argentina exported about 11,000 boxes principally to Brazil and the U.K. By 1939 exports increased to 593,000 boxes to 15 different countries: thus, to U.K. (in boxes) 56,650, Germany 201,900, Sweden 62,500, France 52,700, Netherlands 55,700, and smaller quantities to Switzerland, Norway and Italy; over 140,000 cases were sent to South American and other countries.

Quantity and Variety of Production.

The most rapid development in Apple production has occurred in the **irrigated districts,** particularly in the Rio Negro Valley.

The 1937 census revealed a total of 6,626,000 Apple trees in Argentina, of which 1,241,000 were in the Rio Negro Valley—the principal district for the production of export varieties. (There were plantings of about 50,000 in the Argentina since 1937.) The total production in 1937 was estimated at 2,248,500 bushels. Shipments increased from 135,000 boxes in 1932 to 1,327,000 boxes in 1939.

Buenos Aires district with 3,706,000 Apple trees planted in 1937, is expected to develop as a producing region.

The production of Apples in the Rio Negro Valley in 1945 was expected to be around 3,000,000 bushels, the principal varieties being (in bushels): Delicious (917,000), Rome Beauty (578,000), Red Delicious (451,000), Jonathan (374,000), King David (361,000), Glengyle Red (113,000), with smaller quantities of Stayman Winesap, Gravenstein, Dunns, Cleo., C.O.P., Granny Smith, Golden Delicious, etc.

Pears.

The production of Pears has expanded more rapidly than that of Apples.

The 1937 census showed a total of 5,060,712 Pear trees planted (less than half in bearing), with a production then of 43,792 short tons. The greatest development occurred in the Rio Negro Valley, which has an estimated total of about 2,000,000 trees. Freight loadings increased from 202,000 boxes in 1932 to 2,302,000 in 1939. Exports increased in proportion—from 74,000 boxes in 1934, to 1,417,000 boxes in 1939. It is estimated that 50 per cent. of the production is of the W.B.C. (Bartlett) variety, later maturing varieties making up the balance. The quantities exported to the several countries were as follows (in bushels): U.K. 331,322, Continent 714,234, South America 241,252, with smaller quantities to U.S.A., Africa and elsewhere.

Stone Fruits.

The production of stone fruits, particularly Peaches, Plums, Apricots and Cherries, is rapidly increasing in importance. In 1937 the total plantings for the country as a whole amounted to approximately 17,500,000 trees. There have been more plantings in recent years.

Quinces.

From 3,000,000 trees, about 17,000 tons are harvested. It is an important industry. The fruit is made into Quince preserve, or Quince paste, which vies in popularity with marmalade in England.

Grapes.

Grapes are produced in practically all of the fruitgrowing districts of Argentina—mainly for wine, but table Grapes are becoming increasingly important, especially for the export trade. In the 1937 census the figures were

as follows:—Wine Grapes 259,613 acres, Table Grapes 29,407 acres, Raisin Grapes 2,748 acres.

The Human Element.

The system of land ownership and the type of people working the farms, orchards and vineyards are serious drawbacks to the development and future of the Mendoza region (the principal wine Grape area).

The owners of the farms throughout Mendoza and San Juan are business or professional people, who have made money in other lines. They do not live on the properties but reside in the cities, many of them in Buenos Aires, 700 miles away.

Ninety per cent. of the men who work the land cannot read or write. Farm advisers must go and demonstrate how things are to be done. The larger places have a farm manager who is partly paid by crop returns.

The people who live and work on the estates have a very low, almost primitive standard of living. Their houses are made of adobe or bamboo cane plastered together with mud. The floors are of dirt and the furnishings scanty and the very cheapest that money can buy. Their wardrobe consists of what they have on their backs. Sanitary facilities are virtually non-existent.

Livestock, fowls and people all share the same four walls.

Nurseries and Source of Nursery Stock.

Most of the early plantings made in Argentina consisted of trees introduced from Australia. Australian trees are numerous in the Atlantic region. In the irrigated districts of Rio Negro and Mendoza, however, growers originally propagated most of their own stock, as the Australian stock was not considered suitable for Argentine conditions.

The railroads as well as private nursery firms, undertook to establish their own nurseries and furnish trees to the growers. Many trees were also brought in from the United States—these trees were largely used as foundation stock and were grown for scion and budwood in propagating the Argentine stock. Many different stocks have been used, but growers are finding French Crab stock best suited to their conditions. A large number of Apple trees a few years ago were worked on Northern Spy roots, but they have likewise proven unsatisfactory, and their use has been discontinued.

Among the private nurseries, the Los Alamos Nursery at Cipolletti, in the Rio Negro Valley, is outstanding. The property consists of 163 acres, but only 75 acres (500,000 plants) have been used for nursery stock. Only recommended varieties of commercial importance are produced, which reduces the selection but standardises the plantings.

Principal Varieties.

Those responsible for commercial fruitgrowing in Argentina are to be congratulated on their choice of varieties. They studied the requirements of the market and based their selection on those varieties that proved to be in the greatest demand and that commanded the best prices. Special attention has been given to the introduction of sports or the more recently developed colour strains. When the Red Delicious was introduced, it was immediately purchased and planted in large numbers. Furthermore, old Delicious trees were promptly top-worked or grafted over to the new strain. The same has occurred in the case of Jonathan, Rome Beauty and other varieties. When the percentage of Williams Pears became excessive, a selection of Pear varieties was made, based largely on preference of the European market. The same careful selection has occurred in stone fruits.

In Apples the most heavily planted variety is Delicious. The Red Delicious is rapidly displacing the Stark's Delicious. Rome Beauty is the second leading variety. The fruit is beautiful. King David is next in importance, followed by Glengyle Red which is the Australian version of the American Red Rome. Stayman Winesap was planted heavily, but is not proving popular, as oversized fruit is produced and it is subject to splitting and cracking. Cox's Orange Pippin and Granny Smith were planted to provide fruit for the English market. The Argentine Cox is deemed hardly suitable for the English trade. Granny Smith does well and plantings are on the increase.

Pears.

Williams is the predominating variety. Many d'Anjou trees are still young: high quality, well-formed fruit is produced. The Aremberg (Glou Morceau) has been heavily planted, but a percentage of the fruit is irregular in shape, and it is not a popular export variety. High quality Bosc are grown, but it is not being heavily planted because of unsatisfactory marketing conditions.

The Passe Crassane variety, grown extensively in France, Holland and Belgium, has been quite heavily planted in Argentina. It seems to do quite well. The fruit is smooth, well-shaped and sizes up well. **Packham's Triumph grows exceedingly well: under Argentine conditions the fruit is superior to the Australian product.** Winter Bartlett and Winter Nelis grow satisfactorily.

Cool Storage.

While Rio Negro has no cold-storage plants in the producing areas, the provinces of San Juan and Mendoza can boast of one each—modern buildings with excellent loading and unloading facilities, and direct handling from storage chamber to refrigerator car.

There are cool stores near Bahia Blanca and Buenos Aires, to pre-cool and hold fruit for the export trade. In Buenos Aires there are four stores with a total capacity of 700,000 cases.

It is recognised, however, that the Argentine fruit industry is badly in need of more and better cold-storage facilities especially in or adjacent to the areas of production.

Marketing.

The original idea in promoting fruit culture in Argentina was to make the country self-sufficient, and it did not take long to achieve this objective. During recent years Argentina has exported about 38 per cent. of the total commercial Pear production and about 26 per cent. of the commercial Apple crop. **The industry is still in its infancy, however, and most orchards have not yet reached their prime.** The export movement must therefore be increased if the industry is to survive.

Efforts to stimulate the consumption of fruit as an aid to public health and to the fruit industry have met with considerable success. The Ministry of Agriculture has established a bureau known as La Session Commercial de la Fruta, which sells fruit direct to towns and municipalities in large quantities at low prices.

The marketing and distribution of Argentine fruit for both domestic and export markets is handled by wholesalers and exporters located at Buenos Aires. The Argentine Fruit Distributors is the only agency that bears any resemblance to a co-operative selling agency. Until recently this was a subsidiary of the British owned Great Southern Railway.

Argentine fruit exporters are fully alive to the fact that the industry is facing a grave situation with regard to the successful marketing of its products. Many leaders are of the opinion that the prospects for placing a substantial volume in Europe are becoming more and more

remote. Because of the loss of European markets (during the war), Argentine shippers are hopeful of making substantial gains in their shipments to the United States (Since this was written the war has ended, and Argentine is again looking to British and European markets as outlets for its fruit.—Ed.)

Canning and Drying.

The canning and drying of fruits in Argentina has developed along with the growth of the fresh-fruit industry. As production increased the usual problem of what to do with the surpluses and off-grade fruit entered into the picture. This, however, did not remain a problem for long, since the large meat-packing concerns saw an opportunity in constructing processing plants in the fruit-producing districts. Modern, up-to-date machinery was imported from the United States and the plants have been operated on a highly efficient basis. Other interests have also entered the same field.

The plants have accomplished three things: (1) relieved Argentine growers of their surplus and off-grade fruit; (2) reduced imports of canned fruits, largely from the United States; (3) created a greater cash income for the farmer by fostering the growing of highly perishable crops that cannot be shipped to export markets.

The possibilities of developing export markets for canned and dried products are not being overlooked. Efforts have been made to interest the British market in canned Pears, and other fields are being explored. Exports were started in 1938, and in 1939 about 20,000 cases of 2½ size cans were shipped to Britain. While it is stated that the possibilities of developing exports are not very encouraging because of the high cost of sugar and tin, **these charges can be offset to some extent by cheap labour and low prices paid for the fruit.**

The principal products canned, and the quantities produced in 1939 are as follow:—Quince jam, 9,000 tons; Tomato paste, 6,000 tons; canned Peaches, 5 million cans; canned Pears, 1 million cans; Peas (quantity unknown).

Fruit drying is a less highly organised industry than is canning. The Argentine Government has taken an active part in promoting the dried-fruit industry. Their primary interest is, first to establish a position of self-sufficiency, and second, to develop overseas outlets for exportable surpluses. It is only recently that active measures have been taken to place the industry on a commercial basis. The following varieties are recommended for drying:—

Pears: Williams, Gifford, Clapp's Favourite, Hardy.

Apples: Delicious, Jonathan, King David, Rome Beauty, Gravenstein.

Apricots: Royal, Blenheim, Tilton, Moorpark.

Peaches: Elberta, Muir.

Plums: D'Agen, Coe's Golden Drop.

Grapes: Muscatel, Thompson Seedless, Cereza.

The production of dried fruits in Argentina increased from 4,678 short tons in 1937 to 11,648 short tons in 1940, or 149 per cent.

Trends and General Outlook for Deciduous Fruit.

During the past ten years Argentina has risen from obscurity to international importance as a fruit producing nation. Soil and climate in the irrigated distrcts are especially adapted for the production of high quality fruit. Diseases and pests are as yet of no real economic importance. The most popular market varieties are grown, the fruit has good carrying and keeping quality. Production costs are low: in fact growers contended that under 1940 conditions, if they could secure 1 peso (30 cents—say 1/3) a box for Pears and 1.50 pesos (45 cents—say 1/10½) a box for Apples, delivered to the packing shed, they could make a reasonable profit.

The following factors, however, must be taken into account in a consideration of the future of the industry:—

(1) Problems associated with close planting (15, 20 and 25 ft.), orchards planted if in frost pockets, or in the path of frequent hailstorms.
(2) Insect pests and disease . . sure to develop.
(3) Difficulty of soil maintenance, through soil depletion . . . the building up of soils with green crops and fertilizers will increase production costs.
(4) Excessive plantings of William Pears.
(5) The industry as yet has received no financial aid from the Government, but it is quite possible that agencies will have to be set up to take care of the surpluses if the industry is to survive.

Citrus Fruits.

Argentine is still an importer of citrus fruit, but it is striving for and rapidly approaching a state of self-sufficiency. Plantings in recent years have been developed on a large scale.

The 1937 census showed that the number of Sweet Orange trees planted amounted to 9,226,000 trees, with a production of 3,493,000 boxes.

As a commercial industry, citrus growing in Argentina is in its infancy. The climate seems to be well adapted to citrus fruit, but the industry has been retarded by losses suffered from a faulty choice of rootstock.

Native Oranges are popular with the people. They are not produced for export, and, since local markets are not discriminating, appearance is not an essential requirement as long as the Oranges are sweet and full of juice; they ripen from May to September, and on the whole have a wild and "tree-run" appearance. Native trees bear well generally and are perhaps the most reliable source of Orange supply. Commercial varieties have been introduced: Hamlin, Valencia, Lue-Gim-Gong, Pera, Washington Navel and Parson Brown.

Prospects for Citrus Industry.

Citrus can be successfully produced in Argentina, provided locations are selected and the proper rootstock is found.

Argentina is still an importer of Oranges, taking about 2 million boxes annually, principally from Paraguay and Brazil.

The 1944 potential production of Mandarins was estimated at 4 million boxes. Good returns stimulated increased plantings, and the security of this fruit is threatened. Lemons have proved a profitable crop, but plantings have been largely increased.

Through loss of trees the Grapefruit industry has virtually collapsed and there is little possibility that an effort will be made to revive it.

In conclusion it was stated that the possibility of developing an outlet for American fruit in Argentina is extremely doubtful.

The Processing of Apple Juice

A resume of research activities on Apple juice at the New York State Agricultural Experiment Station, Geneva, N.Y.

Carl S. Pederson, H. G. Beattie.

APPLE juice or cider has been prepared for years and sold fresh, benzoated or fermented. Recently attempts have been made to process the juice so that it could be made available the year round. Many had observed that the raw juice when pasteurised, clouded and deposited a heavy, unsightly sediment which did not mix well even after thorough shaking.

Early studies at this Station, as well as in other research institutions, centred around the production of a clear juice, free from the unsightly sediment. Methods of clarification were studied, including heat preparation by pectic enzymes, and clarification by rough filtration followed by Seitz filtration. "Pectinol" was developed. Heat to inactivate enzymes was found essential regardless of the fact that sterility could be accomplished by other means. Brilliantly clear products, pleasing to the eye of the consumer, could be prepared by any of the procedures. Moreover, these juices were relatively stable after pasteurisation, but ultimately clouded and deposited a slight sediment. However, any of the processes are time consuming and costly, and the resulting juice does not have the full body and character of the natural juice.

In attempting to produce a natural or unclarified processed juice, studies have been conducted to determine the causes of deterioration, precipitation and self-clarification of juices. Various factors studied have included temperature and time of pasteurisation, effect of air and deæration, effect of enzymes and oxidative changes occurring between pressing and processing, deterioration due to storage condition and effect of fortification with ascorbic acid (Vitamin C). These studies necessitated a chemical analysis of fruits and juices. **To further utilise the fruits, the possibilities of blending of the various Apples and the juices from small fruits have been studied.**

Apple juice is an acid product, so acid in fact that few bacteria find it a suitable medium for growth. Vegetative yeasts and moulds are readily killed at temperatures far below the processing temperatures formerly used. Less heat is required than that necessary to totally inactivate enzymes. Filling containers full with juice at 165 to 170 deg. F. and allowing them to stand three minutes before cooling is adequate.

Removal of oxygen (air) from juice reduces oxidative changes. It further produces more anaerobic conditions which are unfavourable to development of mould spores that may survive the process. Deaeration and filling containers hot and full is effective in removal of air. Deaeration is furthermore valuable in reducing foaming during filling of containers.

Changes due to enzymes and oxygen are at least partially initiated during the period after Apples are ground for pressing and before the juice is processed. Juices are more stable if processed immediately after pressing.

During storage juices change in flavour, the colour becomes darker, sugars are hydrolyzed, ascorbic acid is destroyed, the viscosity is reduced and clouding and precipitation of suspended solids occurs. Such changes occur rapidly at high temperature but may be reduced to a negligible rate at low temperatures. The total heat applied to a juice determines its stability, whether the heat is applied during pasteurisation, during cooling or during storage. It follows that rapid cooling and storage at low temperature are essential to stability of juice. Addition of ascorbic acid reduces deteriorating effects.

Many of the varieties of Apples may be used to advantage in blends of juices, but their desirability is governed somewhat by their maturity. After picking, Apples change in chemical composition, and as a result, Apples which may give a thin sour juice when first picked may yield a delightful beverage when more mature.

Blends of black and purple Raspberry juices with Apple juice and of Cherry juice with Apple have been found most pleasing. Other juices which have found favour when blended with Apple are Red Raspberry, Blackberry, Dewberry, Elderberry, Currant, Peach, Plum, Grape, and Cranberry. Strawberry blends are relatively unstable. Apple juice being somewhat weak in flavour is readily masked by low percentage amounts of these other juices.

Although at present, with the great demand for fruits, there is little chance of introducing these products, it is believed that later many of them as well as the improved procedures will be adopted.

International Apple Association Annual.

To understand the world is better than to condemn it; to study the world is better than to abuse it; to make the world lovelier and happier is the noblest work of any man or woman.

A machine has been invented in U.S.A. that will deliver a glassful of freshly crushed cold Orange juice for the Australian equivalent of 3d. No less than 7,500 of these machines have been ordered for the Chicago area alone. These will move a lot of oranges.

Special Issue of "The FRUIT WORLD," January, 1946.

Soil Fertility the Basis of Successful Agriculture

HUMUS IS ALL IMPORTANT — DETAILS OF THE "INDORE PROCESS" AND PRACTICAL APPLICATIONS.

BECAUSE OF THE WASTAGE of soil fertility, western civilisation is facing a major crisis. Indeed, unless a halt is called and we get back to Nature's ways, western civilisation is facing extinction.

These are sobering words. There is a note of urgency in recent authoritative works on this subject.

Over the centuries, vast tracts of land in various parts of the world have become deserts. Yet the teeming millions in China have been maintained because of the return to the soil of "waste" products. The secret is the enrichment of the ground with humus.

What is now known as the "Indore process" has attracted favourable attention. Briefly, this is the scientific manufacture and utilisation of humus made from vegetable matter and the urine and excreta of animals.

The Indore process was evolved by Sir Albert Howard, C.I.E., M.A., formerly director of the Institute of Plant Industry, Indore (India), and Agricultural Adviser to States in Central India and Rajputana.

Full particulars are given in his valuable book, "An Agricultural Testament," excerpts of which are as follow:—

The maintenance of the fertility of the soil is the first condition of any permanent system of agriculture. In the ordinary processes of crop production fertility is steadily lost; its continuous restoration by means of manuring and soil management is therefore imperative.

In the study of soil fertility the first step is to bring under review the various systems of agriculture which have so far been evolved. These fall into four main groups: (1) the methods of Nature—the supreme farmer —as seen in the primeval forest, in the prairie, and in the ocean; (2) the agriculture of the nations which have passed away; (3) the practices of the Orient, which have been almost unaffected by Western science; and (4) the methods in vogue in regions like Europe and North America to which a large amount of scientific attention has been paid during the last 100 years.

Little or no consideration is paid in the literature of agriculture to the means by which Nature manages land and conducts her water culture. Nevertheless, these natural methods of soil management must form the basis of all our studies of soil fertility.

What are the main principles underlying Nature's agriculture? These can most easily be seen in operation in our woods and forests.

Mixed farming is the rule; plants are always found with animals: Many species of plants and animals live together. . . The forest manures itself. It makes its own humus and supplies itself with minerals....

The main characteristic of Nature's farming can therefore be summed up in a few words. Mother Earth never attempts to farm without livestock; she always raises mixed crops; great pains are taken to preserve the soil and to prevent erosion; the mixed animal and vegetable wastes are converted into humus: there is no waste; the processes of growth and of decay balance one another; ample provision is made to maintain large reserves of fertility; the greatest care is taken to store the rainfall; both plants and animals are left to protect themselves against disease....

Ancient Civilisations.

Evidences are deduced of agricultural methods in ages long passed. . . lands kept fertile by natural methods to maintain the teeming populations of prehistoric days. "These ancient methods of agriculture are represented at the present day by terraced cultivation of the Himalayas, of the mountainous areas of China and Japan, and of the irrigated rice fields so common in the hills of South India, Ceylon and the Malayan Archipelago."

Then Follows the Story of the Decay of the Roman Empire.

"The main causes of this decline appear to be fourfold: the constant drain on the manhood of the country side by the legions, which culminated in two long wars with Carthage; the operations of the Roman capitalist landlords which contributed quite as much as Hannibal and Hamilcar to the decline in the vigour and the number of the Italian people; failure to work out a balanced agriculture between crops and livestock and to maintain the fertility of the soil; the employment of slaves instead of free labourers. Moneyed landlords, who were speculators and capitalists, destroyed the middle classes and an agricultural proletariat developed. . . A capitalist system of which these apparent interests were fundamentally opposed to a sound agriculture remained supreme. . . Judged by ordinary standards of achievement the agricultural history of the Roman Empire ended in failure due to inability to realise the fundamental principle that the maintenance of soil fertility coupled with the legitimate claims of the agricultural population should never have been allowed to come in conflict with the operations of the capitalist.

The Practices of the Orient.

In the agriculture of Asia we find ourselves confronted with a system of peasant farming which in essentials soon became stabilised. What is happening to-day in the small fields of India and China took place many centuries ago. The agricultural practices of the Orient have passed the supreme test—they are almost as permanent as those of the primeval forest, or the prairie, or the ocean. The small-holdings of China, for example, are still maintaining a steady output and there is no loss of fertility after forty centuries of management.

The Chinese have for ages recognised the importance of the urine of animals and the great value of animal wastes in the preparation of composts. In India far less attention is paid to these wastes, and a large proportion of the cattle dung available is burnt for fuel. On the other hand, in most Oriental countries, human wastes find their way back to the land. In China these are collected for manuring the crops direct. In India they are concentrated on the zone of highly manured land immediately round each village. If the population, or a portion of it could be persuaded to use a more distant zone for a few years, the area of village lands under intensive agriculture could at least be doubled. Here is an opportunity for the new system of Government in India to raise production without the expenditure of a single rupee. In India there are 500,000 villages, each of which is sur-

rounded by a zone of very fertile land which is constantly being over-manured by the habits of the people. Crop yields are high and the plants are remarkably free from disease. Although half a million examples of the connection between a fertile soil and a healthy plant exist in India alone, and these natural experiments have been in operation centuries before stations like Rothamsted were ever thought of, modern agricultural science takes no notice of the results and resolutely refuses to accept them as evidence, largely because they lack the support furnished by the higher mathematics. **They also dispose of one of the ideas of the disciples of Rudolph Steiner, who argue that the use of human wastes in agriculture is harmful.**

Leguminous plants are common. Although it was not until 1888, after a protracted controversy lasting thirty years, that Western science finally adopted, has proved the important part played by pulse crops in enriching the soil, centuries of experience had taught the peasants of the East the same lesson. The leguminous crop in the rotation is everywhere one of their old fixed practices. In some areas one of these pulses—the pigeon pea—is also made use of as a subsoil cultivator. The deep spreading root system is used to promote the aeration of the closely packed silt soils, which so closely resemble those of the Holland Division of Lincolnshire in Britain.

....In this peasant agriculture the great pressure on population on the soil results in poverty, most marked where, as in India, extensive methods are used on small holdings which really need intensive farming. It is amazing that in spite of this unfavourable factor, soil fertility should have been preserved for centuries: this is because natural means have been used and not artificial manures. The crops are able to withstand the inroads of insects and fungi without a thin film of protective poison.

The Agricultural Methods of the Occident.

If we take a wide survey of the contribution which is being made by the fields of the West, we find that they are engaged in trying to satisfy three hungers: (1) the local hunger of the rural population, including the livestock; (2) the growing hunger of the growing urban areas, the population of which is unproductive from the point of view of soil fertility; and (3) the hunger of the machine avid for a constant stream of the raw materials required for manufacture.

Monoculture is the rule. . . On the rich prairie lands of North America even rotations are unknown: crops of wheat follow one another, and no attempt is made to convert the straw into humus by means of the urine and dung of cattle. The straw is a tiresome encumbrance and is burnt off annually.

The machine is rapidly replacing the animal. . . Cultivation tends to be quicker and deeper. . . Machines do not void urine and dung and so contribute nothing to the maintenance of soil fertility. In this sense the slaves of Western agriculture are less efficient than those of ancient Rome.

Artificial manures are widely used. The feature of the manuring of the West is the use of artificial manures. The factories engaged during the 1914-1918 war in the fixation of atmospheric nitrogen for the manufacture of explosives had to find other markets, the use of nitrogenous fertilizers in agriculture increased, until to-day the majority of farmers base their manurial programme on the cheapest forms of nitrogen (N), phosphorus (P), and potassium (K) on the market.[1] What may be conveniently described as the NPK mentality dominates farming alike in the experimental stations and the country-side. Vested interests, entrenched in time of national emergency, have gained a strangle-hold. . . These chemicals and machines can do nothing to keep the soil in good heart. By their use the processes of growth can never be balanced by the processes of decay. All they can accomplish is the transfer of the soil's capital to current account. . . Diseases are on the increase. With the spread of artificials and the exhaustion of the original supplies of humus, carried by every fertile soil, there has been a corresponding increase in the diseases of crops and of the animals which feed on them. . . In crops like Potatoes and fruit, the use of the poison spray has closely followed the reduction in the supplies of farmyard manure and the diminution of fertility. . .

These mushroom ideas of agriculture are failing; mother earth, deprived of her manurial rights, is in revolt; the land is going on strike: the fertility of the soil is declining . . . particularly in the United States, Canada, Africa, Australia and New Zealand. In Great Britain itself, real farming has already been given up except on the best lands. The loss of fertility all over the world is indicated by the growing menace of soil erosion. . . .

The agricultural record has been briefly reviewed from the standpoint of soil fertility. The main characteristics of the various methods of agriculture have been summarised. The most significant of these are in the opera-

tions of Nature as seen in the forest. There the fullest use is made of sunlight and rainfall in raising heavy crops of produce, and at the same time not only maintaining fertility, but actually building up large reserves of humus. The peasants of China, who pay great attention to the return of all wastes to the land, come nearest to the ideal set by Nature. They have maintained a large population on the land without any falling off in fertility. The agriculture of ancient Rome failed because it was unable to maintain the soil in a fertile condition. The farmers of the West are repeating the mistakes made by Imperial Rome. . . The Roman Empire lasted for eleven centuries. How long will the supremacy of the West endure? The answer depends on the wisdom and courage of the population in dealing with things that matter. **Can mankind regulate its affairs so that its chief possession—the fertility of the soil—is preserved? On the answer to this question the future of civilisation depends.**

The Nature of Soil Fertility.

The nature of soil fertility can only be understood if it is considered in relation to Nature's round. . . We must emancipate ourselves from the conventional approach to agricultural problems by means of the separate sciences, and above all, from the statistical consideration of the evidence afforded by the ordinary field experiment. The wheel of life is made up of two processes—growth and decay.

First, consider growth. The soil yields crops: these form the food of animals; crops and animals are taken into the human body and digested there. There is no break in the chain from soil to man. It must therefore be studied as a working whole. The energy for the machinery of growth is derived from the sun; the chlorophyll in the green leaf is the mechanism by which this energy is intercepted; the plant is thereby enabled to manufacture food—to synthesize carbohydrates and proteins from the water and other substances taken up by the roots and the carbon dioxide of the atmosphere. **The efficiency of the green leaf is therefore of supreme importance: on it depends the food supply of this planet, our well-being, our activities. There is no alternative source of nutriment.** Without sunlight and the green leaf, our industries, our trade and our possessions would soon be useless.

The chief factors on which the work of the green leaf depends are the condition of the soil and its relation to the roots of the plant. The plant and the soil come into gear by means of the root system in two ways—by the root hairs and by the mycorrhizal association, i.e., the living fungous bridge which connects soil and sap.

The soil must be ventilated to release carbon dioxide and admit oxygen.

As most of the soil organisms possess no chlorophyll, and moreover have to work in the dark, they must be supplied with energy. This is obtained by the oxidation of humus—the name given to a complex residue of partly oxidised vegetable and animal matter, together with substances synthesized by the fungi and bacteria which break down these wastes. This humus also helps to provide the cement which enables the minute mineral soil particles to aggregate into larger compound particles and so maintain the pore space. If the soil is deficient in humus, the volume of the pore space is reduced; the aeration of the soil is impeded; there is insufficient organic matter for the soil population; the machinery of the soil runs down; the supply of oxygen, water and dissolved salts needed by the root hairs is reduced; the synthesis of carbohydrates and proteins in the green leaf proceeds at a lower tempo; growth is affected. **Humus is therefore an essential material for the soil if the first phase of the life cycle is to function.**

There is another reason why humus is important. Its presence in the soil is an essential condition for the proper functioning of the second contact between soil and plant —the mycorrhizal relationship. By means of this connection certain soil fungi, which live on humus, are able to invade the living cells of the young roots and establish an intimate relation with the plant—the details of which are still being studied. The mycorrhizal association is the living bridge by whch a fertile soil (one rich in humus) and the crop are directly connected, and by which food materials ready for immediate use can be transferred from soil to plant. How this association influences the work of the green leaf is one of the most interesting problems science has now to investigate.

In a fertile soil, the soil and the plant come into gear in two ways simultaneously. In establishing and maintaining these contacts, humus is essential. It is therefore a key material in the life cycle.

Such are the essential facts in the wheel of life. Growth on the one side: decay on the other. In Nature's farming a balance is struck and maintained between these two complementary processes. The only man-made systems of agriculture—those to be found in the East—which have stood the test of time have faithfully copied this rule in Nature.

Nitrogenous fertilizers are obtained by ploughing in crops of Tick Beans.

What is Humus?

Humus is a substance, dark brown to black in colour, which contains a somewhat larger amount of carbon than do plant, animal and microbial bodies; the carbon content is usually about 56 per cent.: humus contains considerable nitrogen—usually about 3 to 6 per cent.—some 12 per cent.: humus contains the elements carbon and nitrogen in proportions which are close to 10 to 1. Humus is not in a static but rather in a dynamic, condition, since it is constantly formed from plant and animal residues, and is continuously decomposed further by micro-organisms: during decomposition humus gives off a continuous stream of carbon dioxide and ammonia.

The effect of humus on the crop is nothing short of profound. Leaves acquire the glow of health; flowers develop depth of colour. The quality of the produce is also beneficially affected. Animals need less food if it comes from a fertile soil. Vegetables and fruit grown on land rich in humus are always superior in quality, taste and keeping power to those raised by other means. . . Resistance to insect and fungous disease is also conferred by humus. In India, the crops grown on the highly fertile soils round the 500,000 villages suffer remarkably little from pests. . .

Soil fertility is the condition which results from the operation of Nature's round, from the orderly revolution of the wheel of life, from the adoption and faithful execution of the first principle in agriculture—there must always be a perfect balance between the processes of growth and of decay. The consequences of this condition are a living soil, abundant crops of good quality, and live-stock which possess the bloom of health. The key to a fertile soil and a prosperous agriculture is humus.

The Restoration of Fertility.

Chapter 3 of Sir Albert Howard's book, "An Agricultural Testament," deals with the restoration of fertility, and he discusses the several sources of soil organic matter: he insists on the importance of observing Nature's methods. Many sources of soil organic matter exist, namely: (1) the roots of crops, weeds and crop residues which are turned under in the course of cultivation; (2) the algae met with in the surface soil; (3) temporary leys, the turf of worn-out grassland, catch crops and green manures; (4) the urine of animals; (5) farmyard manure; (6) the contents of the dustbins of our cities and towns; (7) certain factory wastes which result from the processing of agricultural produce; (8) the wastes of the urban population; (9) water weeds, including seaweed.

The Indore Process.

We now come to the heart of this matter. Sir Albert Howard quotes from practical experiences in this vitally important matter. In the composting of material in the making of humus, it is essential that there be used animal excreta, urine and vegetable matter. He discusses the subject of green-manuring and suggests a reform by growing the green crop to provide material for composting.

The Indore process, originally devised for the manufacture of humus from the waste products of agriculture, has provided a simple solution for the sanitary disposal of night soil and town wastes. The method is a composting process.

The raw materials needed are vegetable wastes and animal residues. The contents of the garbage tin are valuable.

Where livestock is maintained the collection of their waste—urine and dung—in the most effective manner is important.

. . . At Indore the work-cattle were kept in well-ventilated sheds with earthen floors and were bedded down daily with mixed vegetable wastes, including about 5 per cent. by volume of hard resistant material, such as wood shavings and sawdust. The cattle slept on this bedding during the night when it was still further broken up and impregnated with urine. Next morning the soiled bedding and cattle dung were removed to the pits for composting; the earthen floor was then swept clean and all wet places were covered with new earth, after scraping out the very wet patches. In this way all the urine of the animals was absorbed; all smell in the cattle sheds was avoided, and the breeding of flies in the earth underneath the animals was entirely prevented. A new layer of bedding for the next day was then laid.

Every three months the earth under the cattle was changed, the urine-impregnated soil was broken up in a mortar mill and stored under cover near the compost pits. This urine earth, mixed with any wood ashes available, served as a combined activator and base in composting.

In the tropics, where there is abundance of labour, no difficulty will be experienced in copying the Indore plan. All the urine can be absorbed; all the soiled bedding can be used in the compost pits every morning.

In countries where labour is both scarce and dear, objection will at once be raised to the Indore plan. Concrete or pitched floors are the rule. The valuable urine and dung are often removed to the drains by a water spray. **In such cases, however, the indispensable urine could either be absorbed on the floors themselves by the addition of the bedding of substances like peat and sawdust mixed with a little earth, or the urine could be directed into small bricked pits just outside the building,** filled with any suitable absorbent which is periodically removed and renewed. In this way liquid manure tanks can be avoided. **At all costs the urine must be used for composting.**

3. **Bases for Neutralizing Excessive Acidity.** In the manufacture of humus the fermenting mixture soon becomes acid in reaction. This acidity must be neutralized, otherwise the work of the micro-organisms cannot proceed at the requisite speed. A base is therefore necessary. Where the carbonate of calcium or potassium are available in the form of powdered chalk or limestone, or wood ashes, these materials either alone, together, or mixed with earth, provide a convenient base for maintaining the general reaction within the optimum range (pH 7.0 to 8.0) needed by the micro-organisms which break down fibres. Where wood ashes, limestone, or chalk are not available, earth can be used by itself. Slaked lime can also be employed, but it is not so suitable as the carbonate. Quicklime is much too fierce a base.

4. **Water and Air.** Water is needed during the whole of the period during which humus is being made. Abundant aeration is also essential during the early stages. If too much water is used the aeration of the mass is impeded, the fermentation stops and may soon become * anaerobic too soon. If too little water is employed the activities of the micro-organisms slow down and then cease. The ideal condition is for the moisture content of the mass to be maintained at about half saturation during the early stages, as near as possible to the condition of a pressed-out sponge.

Pits versus Heaps.

Two methods of converting the above wastes into humus are in common use. Pits or heaps can be employed.

Where the fermenting mass is liable to dry out or to cool very rapidly, the manufacture should take place in shallow pits. A considerable saving of water then results. The temperature of the mass tends to remain high and uniform. Sometimes, however, composting in pits is disadvantageous on account of water-logging by storm water, by heavy rain, and by the rise of the ground-water from below. All these result in a wet sodden mass in which an adequate supply of air is out of the question. To obviate such water-logging the composting pits are: (1) surrounded by a catch-drain to cut off surface water; (2) protected by a thatched roof where the rainfall is high and heavy bursts of monsoon rain are the rule; or (3) provided with soakaways at suitable points combined with a slight slope of the floors of the pit towards the drainage corner. Where there is a pronounced rise in the water-table during the rainy season, care must be taken, in siting the pits, that they are so placed that there is no invasion of water from below.

Charging the Heaps or Pits.

A convenient size for the compost pits (where the annual output is in the neighbourhood of 1,000 tons) is 30 feet by 14 feet and 3 feet deep with sloping sides. The depth is the most important dimension on account of the aeration factor. Air percolates the fermenting mass to a depth of about 18 to 24 inches only, so for a height of 36 inches extra aeration must be provided. This is arranged by means of vertical vents, every 4 feet, made by a light crowbar as each section of the pit is charged.

Charging a pit 30 feet long takes place in six sections, each 5 feet wide. The first section, however, is left vacant to allow of the contents being turned. The second section is first charged. A layer of vegetable wastes about 6 inches deep is laid across the pit to a width of 5 feet. This is followed by a layer of soiled bedding or farm-yard manure 2 inches in thickness. The layer of manure is then well sprinkled with a mixture of urine earth and wood ashes or with earth alone, care being taken not to add more than a thin film of about one-eighth of an inch in thickness. If too much is added aeration will be impeded. The sandwich is then watered where necessary with a hose fitted with a rose for breaking up the spray. The charging and watering process is then continued as before until the total height of the section reaches 5 feet. Three vertical aeration vents, about 4 inches in diameter, are then made in the mass by working a crowbar from side to side. The first vent is in the centre, the other two midway between the centre and the sides. As the pit is 14 feet wide and there are three vents, these will be 3 feet 6 inches apart. The next section of the pit (5 feet wide) is then built up close to the first and watered as before. When five sections are completed the pit is filled. The advantages of filling a pit or making a heap in sections to the full height of 5 feet are: (1) fermentation begins at once in each section and no time is lost; (2) no trampling of the mass takes place; (3) aeration vents can be made in each completed section without standing on the mixture.

In dry climates each day's contribution to the pit should again be lightly watered in the evening and the watering repeated the next morning. In this way the first watering at the time of charge is added in three portions—one at the actual time of charging, in the evening after charging is completed and again the next morning after an interval of twelve hours. The object of this procedure

is to give the mass the necessary time to absorb the water.

The water needed at Indore was from 200 to 300 gallons for each cubic yard of finished humus.

As each section of the pit is completed, everything is ready for the development of an active fungous growth, the first stage in the manufacture of humus. It is essential to initiate this growth as quickly as possible and then to maintain it. As a rule it is well established by the second or thrd day after charging. Soon after the first appearance of fungous growth the mass begins to shrink and in a few days will just fill the pit, the depth being reduced to about 36 inches.

Two things must be carefully watched for and prevented during the first phase: (1) the establishment of anærobic conditions caused generally by over-watering or by want of attention to the details of charging; it is at once indicated by smell and by the appearance of flies attempting to breed in the mass; when this occurs the pit should be turned at once; (2) fermentation may slow down for want of water. In such cases the mass should be watered. Experience will soon teach what amount of water is needed at the time of charge.

Turning the Compost.

To ensure uniform mixture and decay and to provide the necessary amount of water and air for the completion of the aerobic phase it is necessary to turn the material twice.

First Turn: The first turn should take place between two and three weeks after charging. The vacant space, about 5 feet wide, at the end of the pit allows the mass to be conveniently turned from one end by means of a pitchfork.

Second Turn: About five weeks after charge the material is turned a second time, but in the reverse direction. By this time the fungous stage will be almost over, the mass will be darkening in colour and the material will be showing marked signs of breaking down. From now onwards bacteria take an increasing share in humus manufacture and the process becomes anaerobic. The second turn is a convenient opportunity for supplying sufficient water for completing the fermentation.

Soon after the second turn the ripening process begins. It is during this period that the fixation of atmospheric nitrogen takes place. Under favourable circumstances as much as 25 per cent. of additional free nitrogen may be secured from the atmosphere.

The Storage of Humus.

Three months after charge the micro-organisms will have fulfilled their task and humus will have been completely synthesized. It is now ready for the land. If kept in heaps after ripening is completed, a loss in efficiency must be faced. The oxidation processes will continue. Nitrification will begin, resulting in the formation of soluble nitrates. These may be lost either by leaching during heavy rain or they will furnish the anaerobic organisms with just the material they need for their oxygen supply. Such losses do not occur to anything like the same extent when the humus is banked by adding it to the soil.

Freshly prepared humus is perhaps the farmer's chief asset and must therefore be looked after as if it were actual money. It is also an important section of the livestock of the farm. Although this livestock can only be seen under the microscope, it requires just as much thought

*Anaerobes—(organisms, excepting bacteria, that, while breathing out CO_2, do not breathe in free Oxygen, thence can thrive in medium devoid of this gas).

and care as the pigs which can be seen with the naked eye. If humus must be stored it should be kept under cover and turned from time to time....

Practical Applications.

Chapters are then devoted by Sir Albert Howard to descriptions of the practical application of the utilisation of humus made on the Indore principle, i.e., the remarkable improvements in tea, coffee, sugar-cane, cotton and other plantations, also improvements in the growing of maize, vegetables and fruits.

Town wastes are being utilized in England, India, and elsewhere to great advantage.

Particulars are given in detail of the utilization of town wastes, Nightsoil and dustbin refuse are collected under hygienic conditions; there is no smell. The material is converted into humus and returned to the ground.

It is a commercially successful enterprise.

Illustrations are given showing the processes of the root systems of deciduous and other trees.

One chapter deals with diseases of the soil, including erosion, alkali, etc.

The retreat of the crop before the parasite is stated to be largely due to lack of stamina in plant life due to insufficient humus in the ground.

Soil Fertility and National Health.

In this section there is a comparison between the quality of grains, vegetables, fruits and other crops grown on land adequately enriched with humus and those grown under artificial conditions. In the former there are better crops, free from disease and the nutritional quality of the produce is such that it sustains life abundantly. . . "Medical investigations should be deflected from the sterile desert of disease to the study of health—to mankind in relation to his environment."

Fresh produce from fertile soil is the basis of disease prevention.

Sir Albert pleads for a return of agricultural research —not simply the independent studying of pests, diseases, etc., but the creation of research stations which would be in reality demonstration farms based on soil fertility . . . studying health not disease.

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Altogether this book is a challenge to our present-day thinking, and, based as it is on a return to Nature's ways, is attracting the attention of thoughtful people throughout the world.

The book, and "Agricultural Testament" is worthy of close study by all citizens.

Compost societies are being established in the several Australian States, in New Zealand and other parts of the world.

IMPORTANCE OF NITROGEN

Four-fifths of the earth's atmosphere consists of a harmless inert gas known as nitrogen, but when properly harnessed this same gas is not only the basic constituent of high explosives but it is also one of the most valuable fertilisers known to agricultural science. Nitrogen thus plays a vital part in modern warfare and is a veritable key to victory. Wartime changes made in Australian food production and particularly the emphasis placed on vegetable and fruit production have greatly increased the demand for nitrogenous fertilisers. Farmers and market gardeners throughout the Commonwealth have every reason to be thankful that during the war the Pacific sea lanes were kept open and steamers were available to bring many cargoes of nitrate of soda from Chile to increase the productiveness of our vegetable and fruit growing areas.

The nitrate of soda available to farmers is mined from huge natural deposits in rainless regions of Chile and after treatment is converted into small snow-white rounded granules ready for shipment to all parts of the world to play its part in wartime food production.

Owing to its natural origin Chilean nitrate of soda is not a pure chemical and indeed certain of its advantages are derived from this fact. Its impurities mainly consist of boron, magnesium, manganese and other so-called "minor" elements which are essential for normal healthy plant growth. It also contains an appreciable quantity of iodine and although this element is apparently not maintenance of health in both human beings and farm livestock. The use of nitrate of soda increases the iodine content of various plants and thus renders them of greater nutritional value to man or animals.

Many agricultural authorities are beginning to have doubts about the wisdom of continually using chemical fertilisers and recently there has been a marked swing towards "organic" farming and the use of natural materials for the maintenance of soil fertility.

Chilean nitrate of soda has been used extensively as a fertiliser for over 100 years and is now in greater demand than ever as more and more farmers come to realise the advantages of using this natural high grade source of nitrate nitrogen.

The original Delicious Apple tree found in 1881 by Jesse Heat of Iowa (U.S.A.), shown in picture.

Australian Horticultural Divisions

N.S.W. DEPARTMENT OF AGRICULTURE.

The following is a list of officers in the Division of Horticulture, Farrer Place, Sydney:—

Chief, Division of Horticulture: C. G. Savage, R.D.A.

Chief Fruit Instructor (Pome Fruits): H. W. Broadfoot.

Special Fruit Instructor (Citrus Fruits): R. J. Benton.

Special Fruit Instructor (Stone Fruits): J. A. Ballantyne.

Special Fruit Research Officer. F. T. Bowman, Ph.D., B.Sc., Agr.

Fruit Research Officer, E. G. Hall, B.Sc. Agr.

Assistant Fruit Research Officer: S. M. Sykes.

Viticultural Expert: H. L. Manuel, R.D.A.

Fruit Preserving Instructor: Miss E. C. Mitchell.

Supervising Inspector, R. B. Symington, LL.B.

Laboratory Assistant: J. Kelmet.

Export and Import Branch, Day Street, Sydney.

†L. T. Bilbe, H.D.A. (Senior Inspector).

Inspectors:—V. F. Byrne, L. A. Smith, †B. D. Davis, E. E. Willis, R. J. Jobb, J. Hutchinson, L. L. Bulluss, T. C. Hawkins, †W. D. N. Arnot, F. C. Dengate, †R. W. Robertson

Fruit Instructors—Country Centres.

H. W. Eastwood, H.D.A., Special Fruit Instructor (Tropical Fruit), Murwillumbah; R. B. Kebby, Senior Fruit Instructor (Leeton). Fruit Instructors: J. V. McGrath (Bowral), K. D. McGillivray, H.D.A. (Young), †J. G. Jeater, H.D.A. (Murwillumbah), †J. A. Holbeche, H.D.A. (Orange), E. C. Whittaker (Orange), †F. S. Oldham (Wentworth), †E. C. Levitt, H.D.A. (Baulkham Hills), †C. J. Horth, H.D.A. (Griffith), *A. H. Skepper, H.D.A. (Young), C. P. Fleming, H.D.A., Assistant Fruit Instructor (Leeton), B. O. French, B.Sc.Agr., Assist. Fruit Research Officer, Leeton.

Experiment Orchards.

J. D. Bryden, Senior Orchardist, Bathurst; D. T. Kilpatrick, H.D.A., Senior Orchardist, Hawkesbury Agricultural College, Richmond; *W. D. McGilchrist, H.D.A. (Leeton), †E. C. Connor, H.D.A. (Glen Innes), C. H. Mort, H.D.A. (Wagga Wagga), †J. H. Cann, H.D.A. (Grafton), †C. J. Smith, H.D.A., Assist. Orchardist (Hawkesbury Agric. College).

Viticultural Nurseries.

N. D. Lackie, Superintendent (Narara); A. C. Clifton, Superintendent (Griffith).

Country Inspectors.

A. C. Arnot, H.D.A. (Terrigal), C. F. K. Benton (West Maitland), G. W. Beverley (Griffith), P. C. Bottrell (Baulkham Hills), J. R. Davison (Yenda), S. W. Ferguson (Orange), M. J. Fuller (Wiseman's Ferry), J. N. Hayden (Griffith), †G. W. Hitchcock (Glenorie), J. H. G. Hubbard (Richmond), A. L. Kelman (Newcastle), E. J. Lindsay (Bathurst), P. B. Mackenzie (Batlow), W. A. Mills (Asquith), H. R. Morcom (Armidale), T. N. Powell (Goulburn), J. F. Power (Leeton), V. G. Rose (Albury), W. H. Spinks (Windsor), F. L. Thomas (Pymble), R. B. Thomas (Westmead), S. A. Thornell (Young), J. W. Vass (Tocumwal), †A. E. Vincent (Leeton), R. Wood (Gosford).

Banana Inspectors.

W. T. Flanagan (Tweed Heads), W. H. Flowers (Murwillumbah), †E. P. Foster (Mirwillumbah), J. I. Graham (Coff's Harbour), W. A. Haden (Murwillumbah), †B. H. Halliday (Murwillumbah), S. G. Jeffes (Macksville, A. Joubert, H.D.A. (Lismore), R. W. Norris (Mullumbimby).

Country Potato Inspectors.

W. F. Washington (Guyra), W. Dent (Orange), N. Kamper (Armidale), †N. W. Mansfield (Crookwell), E. E. Winder (Moss Vale), D. Simpson (Glen Innes).

*Enlisted, on active service.

†Returned from active service.

VICTORIA.

Horticultural Division, Department of Agriculture, Victoria.

Hereunder is a list of names, designation and location of the staff of the Hort. Division, Vic. Dept. of Agric.:—

Ward, J. M., Supt. of Horticulture; Read, F. M., Chief Inspector of Horticulture; Tindale, G. B., Cool Storage Research Officer; Cole, C. E., Snr. Hort. Research Officer; Quinn, D. G., Viticulturist, Rutherglen; Kneen, T. H., Senior Hort. Instructor; Gayford, G. W., Special Hort. Instructor, Melb.; Harper, R. S., O/C Hort. Research Station, Tatura; Krone, B. P., Fruit Packing Instructor; Harris, W. H.,* Assist. Fruit Packing Instructor, Shepparton.

Assist. Horticultural Research Officers: Marriott, P. F., With A.I.F.; McAlpin, D. M.,* Bairnsdale; Walsh, J. C., with A.I.F.; Sluiter, G. B., Colac; Goudie, A. G., with R.A.A.F.; Freeman, H., Melbourne; Mullett, R. A., Tatura. Doery, A. C.,* Agric. Research Officer, Berwick; Drake, F. R.,* District Agric. Officer, Hamilton; Hyam, G. N., Hort. Supervisor, Melb.; Griffiths, J. E., Field Assistant, with A.I.F.; Gayfer, W. B., Plot Assistant, with A.I.F.; Gillespie, A. R., Plot Assist., Melb.

Orchard Supervision.

Senior Orchard Inspector, Wadeson, R. T., Melb.; Orchard Supervisors: Baxter, J. G., Mornington; Brown, D. D., Swan Hill; Bullock, A. E., Wangaratta; Bullock, F. J., Kyabram; Davidson, G. H. B., Melb.; Greatorex, F. J., Canterbury; Hatfield, H. L., Geelong; Hope, R. H., Mildura; Lawrey, V. L., Shepparton; Livermore, D. E., Diamond Creek; Muir, J. K., Rochester; Rolfe, W. A., Box Hill; Roberts, R., Mildura; Thomlinson, J., Bendigo; Willis, C. W., Horsham; Wilson, Y., Berwick.

Fruit Inspection.

Senior Fruit Inspector: Keys, W. H. G.. Assist. Senior Fruit Inspector: Morris, R. G. Fruit Inspectors: Aldous, S., Allsop, C., Bass, J. A., Bass, J. C., Bowman, F. H., Broome, R. H., *Farmilo, T. M. H., Foster, E. L., Lawrey, C. C., Morris, A. E., Purcell, H. G., Robinson, F. M., Simpson, A., Spriggins, C. L., Tidswell, H., Warburton, C. A.

*Now acting as Vegetable Extension Officers.

Vegetable Supervision.

Vegetable Supervisors: Trevena, N., Bendigo; Sutherland, J., Bairnsdale; Allen, J. B., Orbost.

Vegetable Inspection.

Vegetable Inspectors: Stiggants, J. H., Melb.; Holt, R. J., Warrnambool; Jones, J. R. D., Bunyip; Siggins, G., Dandenong; Webb, C. R. M., Bairnsdale.

(Plus some 30 temporary Tomato inspectors.)

Fruit Preserving Branch.

Fruit Preserving Expert: Bromfield, Miss R. F. Murray, Miss B. R., Assist. Fruit Preserving Expert, Burnley.

TASMANIA.

Horticultural Division.

Chief Horticulturist: P. H. Thomas. Horticulturists: H. A. Turner (Launceston), T. D. Rapheal, M.A. Dip. Hort. (Cantab), (Hobart), W. F. Walker, N. D. Hort. Eng. (Hobart).

District Horticultural Officers: A. S. Brennan (Huonville and Franklin). R. A. Chapman (Geeveston and Dover), M. K. Beckwith (Cygnet and Channel), W. P. Armstrong (S. E. Districts), W. J. Wright (Hobart and Derwent Valley), H. E. Larner (Launceston and N.E. Districts), K. L. Pierce (N.W. Districts), C. D. Rodman (Tamar Valley).

SOUTH AUSTRALIA.

Officers of the Horticultural Branch—Department of Agriculture. (Compiled, 20/11/45).

Chief Horticulturist: A. G. Strickland, M.Agr.Sc.; Research Officer: H. K. Kemp, B. Agr. Sc., Hons.; Agricultural Botanist: E. W. Pritchard, Dip. Ec.; Experiment Orchard Managers: E. Leishman, R.D.A. (Blackwood), O. E. Halliday (Berri); Horticultural Advisers: R. W. I. Cowley, R.D.A. (Mt. Gambier), C. G. Grasby (Berri), J. B. Harris, R.H.S. Wis. (Gawler), H. H. Orchard, R.D.A. (Torrens Park), C. Pollitt, R.D.A. (Waikerie), N. R. Quinn (Adelaide).

Field Officers: J. R. Nourse, R.D.A., L. Gibson, R.D.A.

Fruit, etc. Inspectors: L. M. Brown (Senior), E. W. Revell, A. E. Roper.

Where addresses are not shown officers are located at Headquarters, Adelaide.

WESTERN AUSTRALIA.

Officers of the Horticultural Branch, Department of Agriculture, Western Australia.

Supt. of Horticulture: M. R. Powell, B.Agr.Sc.; Hort. Research Officer: T. C. Dunne, B. Agr. Sc., Ph.D. (Calif.); Acting Asst. Supt. of Horticulture: T. C. Miller, B. Agr. Sc.; Viticulturist: H. K. Johns; Horticultural Adviser: F. Melville, B. Agr. Sc.

Horticultural Instructors: V. Cahill (Mundaring), R. L. Cailes (Donnybrook), A. T. Gulvin (Albany), T. F. Herlihy (Bridgetown), O. Hanbury (Manjimup), W. P. Fears (Gosnells), W. P. Jamieson, M.D.A. (on leave Military Service), S. E. Bennett, Horticultural Instructor and Acting Port Inspector (Fremantle).

Market Inspector: E. H. Rawson. Agric. Products and Market Inspector, Kalgoorlie, E. J. Badham.

Fruit Fly Inspectors: Senior Officer: E. H. Elkington. Inspectors: E. L. Serisier (Mundaring), G. H. Welby (East Fremantle), J. W. Rolinson (Midland and Junction), L. G.. Hayward (Harvey), W. J. Rennick (Donnybrook), A. S. Forsyth (Kelmscott), A. Brimson (Pinjarra), W. C. Holland (Kalamunda).

Commerce Inspectors: R. J. Lowson (Swan District), C. Merrifield (Swan District), B. Yeates (Swan District), H. R. Haining (Greenmount), A. R. Venton (Donnybrook), A. W. Gull (Metro. Area), P. J. A. Maunsell (Metro. Area), T. E. Ham (Metro. Area), E. K. Wilkins (Bridgetown), C. H. Button (Mt. Barker).

USEFUL INFORMATION.

To find surface of a ball, multiply square of diameter by 3.1416.

To find side of an equal square multiply diameter by .8862.

To find cubic inches in a ball multiply cube of diameter by .5236.

Doubling the diameter of a pipe increases its capacity four times.

A cubic foot of water contains 6¼ gallons, 1,728 cubic inches, and weighs 62½ lb.

To find the pressure in pounds per square inch of a column of water, multiply the height of the column in feet by .434.

Each nominal horse power of a boiler requires 30 to 35 lb. of water per hour.

Steam rising from water at its boiling point (212 degrees) has a pressure equal to the atmosphere (14.7 lb. to the square inch).

To evaporate one cubic foot of water requires the consumption of 7½ lb. of ordinary coal, or about 1 lb. of coal to 1 gallon of water.

A horse power is equivalent to raising 33,000 lb. one ft. per minute, or 550 lb. one ft. per second.

Thermal Unit:—The British Thermal Unit (B.Th.U.) is the amount of heat required to raise one pound of water one degree Fahrenheit.

WEIGHTS AND MEASURES.

Measures of Length.

12 inches	= 1 foot
3 feet	= 1 yard
6 feet	= 1 fathom
16½ feet	= 1 pole
5½ yards	= 1 rod, pole or perch
4 poles	= 1 chain
100 links	= 1 chain
66 feet	= 1 chain
22 yards	= 1 chain
220 yards	= 1 furlong
40 poles	= 1 furlong
8 furlongs	= 1 statute mile
5,280 feet	= 1 statute mile
1,760 yards	= 1 statute mile
6,080 feet	= nautical mile or knot
1 cable's length	= 100 fathoms
7.92 inches	= 1 link
60 nautical miles	= 1 degree
69½ geographical miles	= 1 degree

The diameter of one half-penny is one inch. The diameter of a shilling is fifteen-sixteenths of an inch.

Dry Measure.

2 pints	= 1 quart
4 quarts	= 1 gallon
2 gallons	= 1 peck
4 pecks	= 1 bushel
8 bushels	= 1 quarter

Cereals are generally sold by weight:—

A bushel of wheat = 60 lb.; barley = 50 lb.; oats = 40 lb.; rye = 60 lb.; maize = 56 lb.

CALENDAR 1946

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CALENDAR, 1947.

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DECEMBER.						
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